Report on the Off-grid Lighting Status for Southeast Asia and the Pacific

Prepared for:

United Nations Environment Programme (UNEP) -
Global Environment Facility (GEF) *en.lighten initiative*

Acknowledgements

TERI Project Team:

Pradeep Kumar, Internal Project Advisor

Tarun Garg, Principal Investigator

Ashish Jindal, Technical Team Member

Disha Sharma, Technical Team Member

Shilpa Mohan, Editor and Reviewer
C T Sebastain, Support Team Member

Special Thanks:

TERI would like to acknowledge the following individuals and organizations for their valuable input and support throughout the project:

Asawin Asawutmangkul, Ministry of Energy, Thailand; Laura Fuller, UNEP; Vichet Ratha Khlok , Ministry of Environment, Cambodia; Moira Mathers, lites.asia; Bouathep Malaykham, Ministry of Energy and Mines, Lao PDR; Chanthearith Ou, Ministry of Environment, Cambodia; and, Awang Riyadi, Ministry of Energy and Mineral Resources, Indonesia.

Table of Contents

List of Tables

List of Figures

Executive Summary

The total population of Southeast Asian countries, Indonesia, Lao PDR, Cambodia, Viet Nam, Philippines and Thailand is around 507 million, of which nearly 111 million (around 22 per cent) of the population do not have access to grid electricity, as shown in the Figure 1 below. The total population of the Pacific countries which include 14 island countries (Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of Marshal Island, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu) is around 8.6 million, of which nearly 6 million of the population do not have access to grid electricity as shown below in Figure 2.

Most of the households in these areas depend on conventional fuel burning that is polluting and damaging, both to the environment and their health, which means there is a great need for clean, sustainable and affordable products to bring light to these households. The electrification percentage in Southeast Asian and Pacific countries is shown below in Figure 1 and Figure 2 respectively.

Figure 1: Status of off-grid population in Southeast Asian Countries[1]

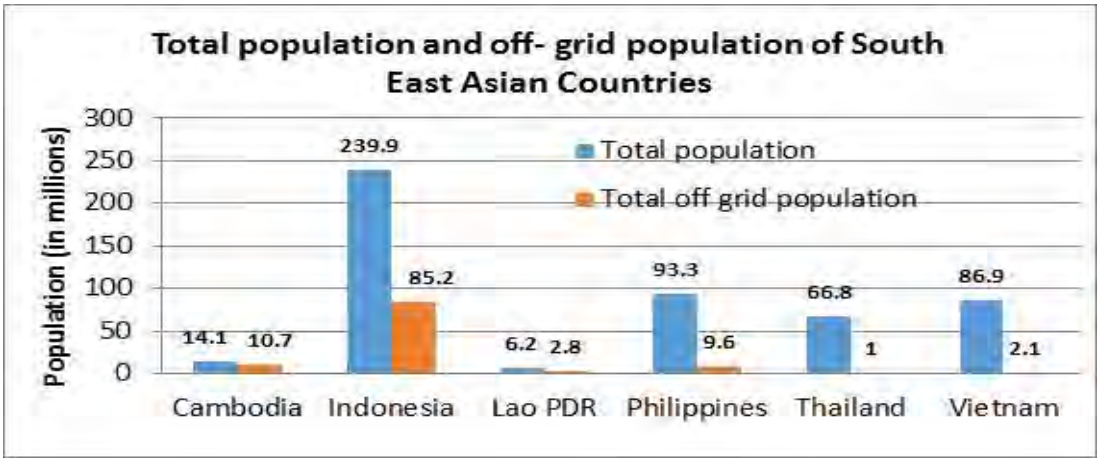
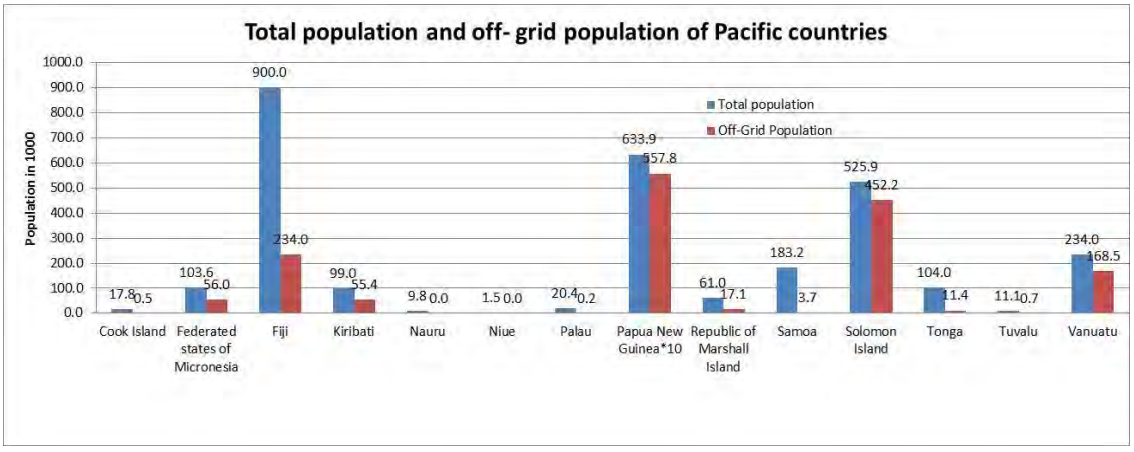


Figure 2: Status of off- grid population in the Pacific countries[2]



1 http://www.enlighten-initiative.org/ResourcesTools/CountryLightingAssessments.aspx
2 Country Energy Security Indicator Profiles, 2009, Secretariat of Pacific Community

This has led to severe effects in various sectors across Southeast Asia and Pacific. Medical and educational opportunities and services are severely constrained; health risks such as irritation to eyes, dermatitis, respiration problems are heightened due to burning of kerosene and opportunities for income generating activities are reduced.

Generation of electricity through renewable means such as wind, solar, hydro and even geothermal energy could emerge as a great alternative in providing clean energy. However, due to the geographical location of these countries, generation of electricity through solar energy is the most appropriate one.

Modern off-grid lighting has emerged with the introduction of solar based light emitting diode technology and has been experiencing a rapidly growing demand. Majorly three types of off-grid lighting systems are used: solar home system, solar street lighting system and solar lantern.

Solar home system

A solar home system uses a photovoltaic (PV) module to provide power for lights and small appliances. The system is also equipped with a battery for ensuring power availability during the night and on cloudy days. Solar home systems usually operate at a rated voltage of 12 V DC and provide power to low power DC appliances such as lights, radios and small television sets. Before installing a photovoltaic solar home system, its size has to be calculated keeping in mind the demand, cost and size of installation.

Solar lantern

A solar lantern consists of a small fluorescent or light emitting diode lamp fitted with a rechargeable battery inside a case which is easy to carry and can stand on the ground or a table, or be hung from the ceiling. Some include a small built-in photovoltaic module, and others are designed to be plugged into a photovoltaic module for charging then detached for use.

Solar street lighting system

Solar street lighting systems are raised light source which are powered by solar panels mounted on the top. Most solar street lighting systems turn on and off automatically and are controlled by day lighting sensors or astronomical clocks.

The transition to efficient off-grid lighting would also result in social and health benefits in terms of providing better quality light. The savings potential in terms of energy and costs, CO_2 mitigation and economic benefits which could be achieved by each country by transition to efficient off- grid lighting system is given in Table 1[3]. A full transition to energy efficient off-grid lighting in Southeast Asia would result in energy savings of 19.3 million barrels of crude oil energy equivalent; cost savings of $ 1,423

3 Country Lighting Assessment, UNEP/GEF en.lighten initiative (2010)

million; and a CO_2 reduction of approximately 7 million tonnes. The total estimated expenditure required would be approximately $ 1.9 billion with a payback period of just 1.3 years[4].

Table 1: Off -grid lighting status for Southeast Asian countries

S No	Parameters	Cambodia	Indonesia	Lao PDR	Philippines	Thailand	Viet Nam	Total
1	Total population (million)	14.10	239.90	6.20	93.30	66.80	86.90	507.20
2	Off- grid population (million)	10.70	85.20	2.80	9.60	1.00	2.10	111.40
3	per cent population off- grid	75.80	35.50	45.16	10.28	1.50	2.41	-
5	Installed stock							
	Kerosene lamp {glass cover} (million)	4.60	36.20	1.20	4.10		0.90	47.00
	Kerosene lamp {simple wick} (million)	1.90	15.10	0.50	1.70		0.40	19.60
	Torch (million)	0.70	5.40	0.20	0.70		0.10	7.10
	Candles {light points} (million)	0.40	3.20	1.10	0.40		0.10	5.20
6	Economic and energy benefits							
	Kerosene savings (billion litres)	256.00	2.00	66.00	221.00		50.00	595.00
	Candles savings (billion)	139.00	1.10	36.00	121.00		27.00	324.10
	batteries savings (million)	34.00	270.00	9.00	30.00		7.00	350.00
	Cost savings (million $)	220.00	792.00	81.00	270.10		60.40	1,423.50

4 Country Lighting Assessment, UNEP/GEF en.lighten initiative (2010)

S No	Parameters	Cambodia	Indonesia	Lao PDR	Philippines	Thailand	Viet Nam	Total
	Payback period (months)	9.00	23.00	6.00	7.00		6.00	
	Energy savings (million barrels of crude oil energy equivalent)	1.90	14.90	0.50	1.60		0.40	19.30
7	Climate Change Mitigation benefits							
	CO^2 reduction (thousand tonnes)	691.30	5,500.00	179.50	598.30		133.90	7,103.00
	Equivalent to no of cars off the road (million)	172.80	14.00	44.90	146.90		33.50	412.10
8	Environment, Health and Social benefits							
	Annual saving per household per year ($)	85.40	38.20	121.50	136.70		122.50	504.30
	Better quality light households (million)	2,400.00	18,700.00	610.00	1800.00		450.00	23,960.00

This report provides detailed information concerning the current status of off-grid lighting for the Pacific and six countries in Southeast Asia and makes an assessment of these towards each component of the en.lighten integrated policy approach that includes: minimum energy performance standards (MEPS); supporting policies; monitoring, verification and enforcement; and environmentally sound management of lighting products. A summary of the different regulations and policy instruments for off-grid lighting that are in place for each of these countries is given in Table 2.

Information is also included on rural electrification projects that are being undertaken in the countries as a natural consequence of these is a decrease in the off-grid lighting population.

Table 2: Summary of regulations and policy instruments for off-grid lighting

	Cambodia	Indonesia	Lao PDR	Philippines	Thailand	Viet Nam	Pacific
MEPS	No	No	No	No	No	Yes	No
Labelling	No	Mandatory labelling for lamps (currently under review) but nothing specific for off-grid lighting	No	Mandatory labelling for lamps but nothing specific for off- grid lighting	Voluntary labelling for lamps but nothing specific for off-grid lighting	Voluntary labelling for lamps but nothing specific for off-grid lighting	No
Tax incentives	No	No	No	Yes	No	No	No
Grants, subsidies, loans	Yes	Yes	Yes	Yes	No	Yes	Yes
MVE programme	No	Yes	No	No	Yes	No	No
Test laboratory capability	No	Yes	No	No	Yes	No	No

Abbreviations

ACCSQ	ASEAN Consultative Committee on Standards and Quality
ADB	Asian Development Bank
AMORE	Alliance for Mindanao Off-grid Renewable Energy
APL	Adaptable Program Loan
ASEAN	Association of Southeast Asian Nations
ASHRAE	American Society of Heating Refrigeration and Air Conditioning
ASTM	American Society of Testing and Materials
BOI	Board of Investment
CFL	Compact fluorescent lamp
CSSC	Clean Energy System Solar Cell Testing Center
DC	Direct current
EIB	European Investment Bank
EPTS	Energy Performance Testing Standards
ESMAP	Energy Sector Management Assistance Program
GEF	Global Environment Facility
GOGLA	Global Off-grid Lighting Association
GWH	Gigawatt hour
IEC	International Electro Technical Commission
IFC	International Finance Corporation
ISC	Institute of Standards of Cambodia
ISO	International Standard Organization
kW	Kilowatt
kWh	Kilowatt hour
MEPS	Minimum energy performance standards
MW	Megawatt
PAS	Pacific Alliance for Sustainability
PEC	Pacific Environment Community Fund
PEEP	Promoting Eenergy Efficiency in Pacific
PICCAP	Pacific Islands Climate Change Action Program
PICHTR	Pacific International Center for High Technology Research
PIGGAREP	Pacific island Greenhouse Gas Abatement Through Renewable Energy Project
PIPESAP	Pacific Island Energy Policy and Strategic Planning and
PIREP	Pacific Island Renewable Energy Project
PREGA	Promotion of Renewable Energy and Energy Efficiency
PRIF	Pacific Regional Infrastructure Facility
PRES	Philippine Rural Electrification Service Project
PTEC	Electrical and Electronic Product Testing Centre
PRISM	Pacific Region Information System
PV	Photovoltaic
REP	Renewable energy programme

RPS	Renewable portfolio standard
SHS	Solar Home System
SME	Small and medium-sized enterprises
SPC	Secretariat of Pacific Community
SPOTS	Solar Power Technology Support Project
SPREP	Secretariat of the Pacific Regional Environment Programme
SPUG	Small power utility group
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VEESL	Viet Nam Energy Efficiency Standard and Labelling Program
VSRE	Viet Nam Sweden Rural Energy Program

1.0 Introduction

More than 25 per cent of the world's population lives without access to electricity[5]. Today, electricity is one of the basic needs required for various purposes like lighting, cooling and in other industrial process. Lighting is something which is required by everyone for studying and working. People around the world uses candles and burn fuels for lighting which lead to negative impact on the environment and also on the health of occupants exposed to emission generated through fuel burning. There is a need to find sustainable solution which could address these issues and provide environment friendly solutions.

Off-grid lighting is one such solution in which lighting is achieved through renewable sources of energy mainly solar energy. The move to off-grid lighting is transforming lives and economies in developing countries around the world by increasing incomes, assisting educational development and improving health and safety.

The United Nations Environment Programme (UNEP) and the Global Environment Facility (GEF) in collaboration with the private sector launched the en.lighten initiative in 2009 with the main objective of accelerating the global transformation to efficient lighting through promoting high performance, energy efficient technologies and phasing out inefficient incandescent light sources. The UNEP-GEF en.lighten initiative assists developing and emerging countries by providing technical and policy support in their transition to energy efficient lighting.

This report has been prepared for the UNEP-GEF en.lighten initiative by The Energy & Resources Institute (TERI), New Delhi, India. The Southeast Asian countries included in this report are: Cambodia, Indonesia, Lao (PDR), Philippines, Thailand and Vietnam. Pacific countries include: Cook Island, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

The report provides detailed information concerning the current status off-grid lighting in the region and makes an assessment of region's readiness for each component of the en.lighten integrated policy approach that includes: minimum energy performance standards; supporting policies and monitoring, verification and enforcement. An estimate of a transition in terms of the environmental and economic benefits for each country has also been produced and highlighted in the report[6].

A summary of various initiatives on off-grid lighting in the Southeast Asian and Pacific countries is attached as Annexure I and Annexure II respectively, and are also mentioned in detail in Chapter 3.0 and Chapter 4.0 of the report.

The information used to develop this report originates from various official sources, articles, publications and contacts within several departments in relevant ministries and pertinent agencies in the countries of Southeast Asia and the Pacific. Efforts have been made to include the latest information wherever available. It is also possible that this report may include potential gaps concerning the status of activities in the countries or other information. Every effort has been made to present accurate information, but any error or misinformation discovered after the report has been published, is regretted.

5,6 http://www.enlighten-initiative.org/ResourcesTools/CountryLightingAssessments.aspx

2.0 Global Initiatives on Off-grid Lighting

For off-grid lighting, several initiatives have been started by various organisations like Lighting Global, World Bank, Asian Development Bank (ADB), United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP).

Global Off-Grid Lighting Association (GOGLA)[7]

A neutral, independent, not for profit association called Global Off-Grid Lighting Association (GOGLA) was conceived out of a joint World Bank/IFC Lighting Africa and private sector effort in 2012. The main objective of GOGLA is to accelerate market development for energy access. Details of the some of the global initiatives are provided below.

Although the market is experiencing rapid and robust growth, missing access to capital is still one of the main barriers the off-grid lighting industry faces. Together with GIZ, A.T. Kearney, QUADIA, the Solar Energy Foundation, and Solar Aid, the Global Off-Grid Lighting Association (GOGLA) has published a study on investment and finance for off-grid lighting. The study provides a comprehensive and informative off-grid lighting market study to raise awareness of the opportunity and support finance professionals as they evaluate it. It reviews the market for solar off-grid lighting products, highlights creative solutions and concludes that improved financing can promote industry growth.

In a series of investor conferences GOGLA is marketing the study results and facilitating a dialogue between the industry and the investment sector. At the events industry and investment case studies are presented to show up pathways towards getting invested in a sector offering attractive returns. The first investor conference took place in cooperation with Credit Suisse in Zurich. The next conference will take place 16th of December in cooperation with Bloomberg New Energy Finance in London (invitation only). Additional conferences are planned for spring and summer 2015 in the USA.

Quality Assurance Project[8]

For a new product/technology to survive in the market, quality has to be ensured as a poor quality product leads to mistrust amongst the users and it affects sustainable market development. In cooperation with GIZ, GOGLA initiated a project with the objective of building on the work of IFC and Schatz Institute and making a major contribution to the development of a quality assurance concept. The objective of the project was to enable a transparent and informed discussion and consultation process in which every participant can draw on the same level of information and knowledge.

Around 40 experts from industry, development agencies, IFC, test laboratories and bureau of standards, participated in the GOGLA quality assurance symposium that took place 2-3 April 2014 in Cologne. In a combination of presentations, workshops and moderated discussions, topics like the development and optimization of IEC TS standards, the setup of efficient products testing and certification, a standardized performance reporting and

7 http://global-off-grid-lighting-association.org/facilitating-investment-in-the-off-grid-lighting-sector/
8 http://global-off-grid-lighting-association.org/quality-assurance-project/

quality label, and the extension of standards in order to take into account developments like Solar Home Systems were addressed.

The Lighting Global product quality verification program has become the off-grid lighting industry standard for quality assurance. There are currently more than 45 Lighting Global quality verified products from more than 25 manufacturers retailing globally.

Energy for All Lighting for All [9]

In Asia, solar devices are promoted by an extensive number of small and medium sized companies. Despite existing commercial and semi-commercial models for lighting, up-scaling of these efforts has been challenging due to lack and limitations of finance, of exchange of knowledge and awareness, of common standards and policies and of distribution mechanisms.

The Energy for All Partnership with support from ADB, established the thematic working group *Lighting for All* to meet these challenges. It expands access to solar lighting technologies among rural communities by linking the international lighting industry (including storage, electrics and solar) with local system integrators, financers and service providers. For local communities, this transfer of technological knowledge strengthens their capabilities to design, develop and deliver high-efficiency, high-quality, reliable and affordable lighting products and services. For the industry, it catalyses the undeveloped, high-growth rural lighting market by providing cutting-edge technologies and know-how adapted for local challenges.

The main goal of the Energy for All initiative is to provide access to electricity to 675 million people in Asia who do not have the access to grid. So far, the Energy For All initiative has reached up to 4.5 million people.

Lighting Global [10]

Lighting Global is the International Finance Corporation's (IFC) platform to support sustainable growth of the global off-grid lighting market in order to increase access to modern lighting services for people without access to reliable electricity.

Through Lighting Global, IFC and the World Bank collaborate with the Global Off-Grid Lighting Association (GOGLA), and work closely with a broad range of stakeholders, including manufacturers, distributors, micro-finance institutions, NGOs, governments, product testing laboratories, standards bureaus, and consumers in order to support the development of the market and remain responsive to its changing needs.

Lighting Global supports market development by promoting product quality to avert market spoilage and protect consumers. Lighting Global supports a network of regional programs such as consumer education campaigns, link up manufacturers and distributors, and leverage finance for scale up of product distribution networks. The programs are country specific and developed according to the requirement.

IFC manages country programs jointly with the World Bank in several African countries through the Lighting Africa program. IFC also manages programs in India and Papua New Guinea through the Lighting Asia program, and is developing new country programs in Bangladesh, Pakistan and Indonesia.

9 http://www.energyforall.info/working-groups/lighting/
10 http://www.lightingglobal.org/

Quality Assurance Program[11]

Lighting Global supports the growing global market for modern off-grid lighting with a widely applicable, rigorous Quality Assurance (QA) framework. The key components of Lighting Global QA program are: Minimum quality standards, standardized specification sheets, product test brochures, testing statistics

The Lighting Global framework served as the foundation for—and is now based on—International Electro technical Commission (IEC) Technical Specification 62257-9-5, *Recommendations for small renewable energy and hybrid systems for rural electrification - Part 9-5: Integrated system - Selection of stand-alone lighting kits for rural electrification*. This IEC specification provides the global QA framework for off-grid lighting.

Lighting Asia[12]

Lighting Asia/India is a market-transforming program with the objective of promoting both the value and presence of modern, off-grid lighting amongst the off-grid population in rural India. Modern off-grid lighting includes solar lighting appliances, solar home systems and connections to renewable energy mini-grids. In India, where 43% of rural households continue to rely on kerosene as a primary source of fuel, improving access to modern lighting technology holds the promise of higher productivity, improved health and a better quality of life

Lighting Asia/India is the first Asian lighting programs for IFC. It builds on a successful joint IFC-World Bank Lighting Africa program (www.lightingafrica.org) launched in 2007.

Lighting Asia/India program will enable access of two million rural Indians to off-grid lighting solutions by 2015. The program is designed with a series of interventions to alter market behaviour by removing specific barriers, for example, the market spoilage created by poor products, lack of information on quality products and on distribution channels, lack of financing for companies and consumers, lack of awareness that quality solar appliances are affordable, viable solutions and other issues related to a scale up of the category. The IFC is planning to implement their Lighting Asia initiatives in Bangladesh, Nepal, Cambodia, Indonesia, Pakistan and the Philippines.

11 http://www.lightingglobal.org/activities/qa/
12 http://lightingasia.org/index.php/component/content/article?id=76

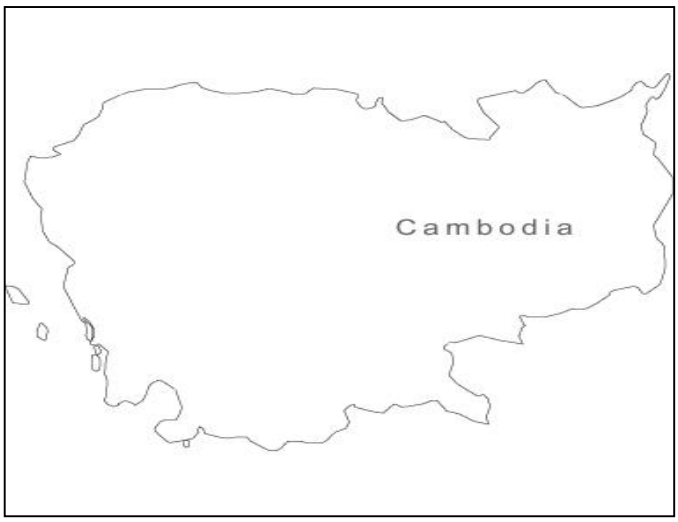
3.0 Off-grid Lighting Status in Southeast Asian Region

3.1 Cambodia

Cambodia imports approximately 1.5 times more energy than it produces. The major source is oil followed by hydro power and coal. Solar energy forms a miniscule component in the overall energy composition of the country (nearly 0.3 per cent of total generation). There has been a growth of 15 per cent in the overall energy consumption of the country in 2011 as compared to 2010.[13]

The total population of Cambodia is 14.1 million, of which more than 75 per cent do not have access to on-grid electricity[14]. The urban electrification rate in Cambodia is 97 per cent whereas the rural electrification rate is 18 per cent[15].

The two major sources of lighting for people without electricity grid are kerosene and diesel charged batteries. Currently, there is no subsidy on kerosene and batteries by the Royal Government of Cambodia which makes the cost of kerosene based systems high in comparison to solar home systems calculated over the lifespan of solar home systems (10 years).[16]



Total population: 14.1 million

Off- grid population: 10.7 million

Electrification rate: 34%

Urban electrification: 97%

Rural electrification: 18%

3.1.1 Regulatory and Control Mechanisms

Institute of Standards of Cambodia under the Ministry of Industry Mines and Energy is the body responsible for drafting and issuing of Cambodian Standards and Guidelines and registering of regulated products. Institute of Standards of Cambodia is also entrusted with the task of establishing, recognizing and maintaining laboratories; certifying conformity and safety of products; providing training and consultancy services to promote standardization and quality. Cambodia is a correspondent member of International Standards Organization

13 Based on data from IEA, Statistics: Electricity and Heat 2011 & 2010, http://www.iea.org/statistics/statisticssearch/report/?country=CAMBODIA&product=electricityandheat&year=2011

14 Country Lighting Assessment, UNEP/GEF en.lighten initiative (2010)

15 IEA, World Energy Outlook, 2013

16 Lighting Asia: Solar Off-Grid Lighting – International Finance Corporation

(ISO), an International Electro-technical Commission (IEC) affiliate country and a member of the ASEAN Consultative Committee on Standards and Quality (ACCSQ)[17].

3.1.1.1 Energy Performance Standards

Presently there are no Minimum Energy performance Standards (MEPS) existing for the user sale of energy efficient lamps and off-grid lighting system. Also, there are no plans to phase-out low efficiency lamps. However, there exists a regulatory framework for the safety label for electric and electronic household products[18].

3.1.2 Economic and Market-Based Instruments

3.1.2.1 Rural Electrification Fund[19]

The Royal Government of Cambodia, with support from the World Bank and Global Environment Facility (GEF), launched a large- scale programme in 2004 to provide electricity (of some form) to all rural households by 2020 and by 2030, at least 70 per cent of all household will have access to grid quality electricity. The programme includes bulk purchase of 12, 000 solar housing systems (each having a capacity of 40 Watt peak (Wp) and plans to install them in seven targeted provinces of Kampong Thom, Kampong Speu, Pursat, Preah Vihear, Siem Reap, Mondul Kiri and Rattanak Kiri.

It also encourages and promotes the participation of the private sector in providing sustainable rural electrification service for optimal utilization of well proven new and renewable energy technologies. However, due to initial poor results[20], the programme has been restructured. In the restructured version, households will be selected from areas that are not likely to be connected to the wider grid in the next three to five years. Also, in addition to the original $100 grant under the programme, households will have the option to pay in full upfront or in interest free instalments over a period of five years.

3.1.2.2 MoonLight Rental Scheme[21]

MoonLight is an initiative by Kamworks (a solar company in Cambodia which was started in 2006, and provides extended services in all areas of solar electricity), wherein village entrepreneurs are renting out solar lanterns at rates matching daily kerosene expenditure. The project was initiated in 2008 and was expanded to 75 entrepreneurs in 2011. The lantern comes with a small solar panel to charge its internal battery. With the aim of scaling up the scheme, Kamworks is collaborating with Pico Sol (a NGO working for the cause of electrification of rural areas in Cambodia) supported by ADB's Energy for All program.

3.1.2.3 Solar Campus[22]

Kamworks, in collaboration with Pico Sol has set up a training institute, 'Solar campus 'which provides training on solar energy and is 100 per cent solar powered without grid connection. Kamworks also incentivizes those who participate in the training programs with discounts on purchase of solar home systems.

17 Cambodia, Correspondent Member, http://www.iso.org/
18 Cambodia, Ninth lites.asia meeting http://www.lites.asia/downloads/kuala-lumpur-2014
19 http://www.ref.gov.kh/
20 Only 95 SHS against a target of 12, 000 were distributed
21 MoonLight Rental Scheme, http://www.kamworks.com/
22 Lighting Asia: Solar Off-Grid Lighting – International Finance Corporation ,PP 92

3.1.3 Fiscal Instruments and Incentives

3.1.3.1 Tax Incentives

Currently, there are no tax incentives or import duty concessions for energy efficient equipment or service.

3.1.3.2 Grants, Subsides and Loans [23]

As discussed in Section 2.1.2.1, the Rural Electrification Fund provides a grand of $100 per solar home system of a minimum capacity of 40 Wp. Kamworks and Pico Sol are involved in developing a Solar Guarantee Fund for entrepreneurs thereby making finance accessible to them. Also, Amret Microfinance[24] and ACLEDA Bank[25] are financing entrepreneurs in setting up battery charging stations. They have also funded solar SMEs but the scale of financing is unknown. Rental models are also being tested in a few areas where entrepreneurs (such as Kamworks[26]) are lending solar lanterns on a daily basis.

3.1.4 Monitoring, Verification and Enforcement (MVE) Activities [27]

The various organisations responsible and various on-going MVE activities for off-grid lighting system in Cambodia is as explained below

- Ministry of Industry and Handicrafts via Institute of Standards Cambodia, is responsible for licensing products for use of the Cambodian standard mark prior to its entry into the market.
- Imported and domestic lighting products regulated for sale in Cambodia must comply with mandatory standards and be licensed to use the Cambodia standard mark. It is reported that mandatory testing is required for these products. This testing is coordinated by CAMCONTROL, while custom officers check imported products in terms of nature and quantity.
- Cambodia Import-Export Inspection and Fraud Repression Director General under Ministry of Commerce is responsible for controlling the quality testing of products
- Ministry of Industry and Handicrafts and Ministry of Energy are responsible for enforcement activities in Cambodia

Cambodia does not have a strategic framework for MVE of off-grid lighting system. There are no market surveillance programs to check the compliance of products with licensing. There are no Laboratories for testing of lamps and other off-grid lighting components and Cambodia relies on the results of the testing done at the countries of import. Cambodia doesn't have a legal framework in place for authorizing the enforcement of non-compliance.

23 Lighting Asia: Solar Off-Grid Lighting – International Finance Corporation, PP 94,95,96

24 Amret is a leading micro-finance institution in Cambodia with support from national and international institutions. In responding to the demand of various micro-finance services, Amret has developed many kinds of financial products and service, especially small scale loan for people in the rural areas and medium scale loan for small and medium enterprises. Amret (2014). Accessed 27 August 2014 at www.amret.com.kh/amret/index.php/en/about-us/about-usen

25 ACLEDA Bank Plc. is a public limited company, formed under the Banking and Financial Institutions Law of the Kingdom of Cambodia. Originally, it was founded in January 1993, as a national NGO for micro and small enterprises' development and credit. ACLEDA Bank plc (2014). Accessed 27 August 2014 at www.acledabank.com.kh/kh/eng/ff_overview.php

26 http://www.kamworks.com/news-details/innovation-kamworks-uses-mobile-technology-to-expand-the-access-to-clean-energies-in-cambodia/

27 UNEP Policy Status report on Lighting MVE activities in Southeast Asia

3.1.5 Production and Manufacturing[28]

Currently, there are very few manufacturers in Cambodia which have the capacity to manufacture off-grid lighting components. Kamworks is the sole organization manufacturing solar home systems and solar lanterns in the country. Other companies, such as Yejj Solar, Khmer Solar, SME Renewable and others are involved in importing, design, distribution and installation of off-grid lighting systems.

Most of the products are imported from different countries and there are no guidelines/ standards for checking the performance and quality of products imported

3.1.6 Benefits of Transition to Efficient Off-grid Lighting Systems[29]

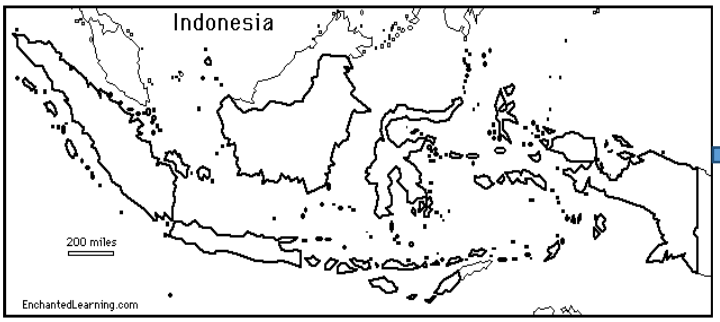
For Cambodia, the transition to efficient off-grid lighting systems would result in a saving of around 256 billion litres of kerosene, 139 billion numbers of candles, 34 million batteries which would result in savings of around $220 million every year. The initial cost for installation of efficient off-grid lighting systems would be recovered in nine months. In terms of climate change, there is a potential of reducing the CO_2 emissions by around 691 thousand tonnes/ year.

3.2 Indonesia

Indonesia has witnessed high growth rates (over 6.5 per cent) after the recent global recession which is reflected in its growth of energy consumption. There has been an 8 per cent increase in energy demand in 2011 as compared to 2010, with a phenomenal rise in the use of coal as the source (approximately 20 per cent).[30]

The total population of Indonesia is 239.9 million, of which more than 36 per cent do not have access to electricity[31]. The urban electrification rate in Indonesia is 85 per cent whereas the rural electrification rate is 60 per cent[32].

As per Perusahaan ListriK Negara (PLN), largest energy provider in the country, 40 per cent of off-grid areas are located largely outside the island of Java and are unlikely to be reached by the national electrification grid. There have been efforts to provide electricity through diesel mini-grids, but they have incurred losses and discouraged private sector investment due to uniformity in electricity tariff across the country. This strengthens the case for large scale usage of off-grid lighting solutions such as lanterns and Solar Home System.[33]



Total population: 239.9 million

Off- grid population: 85.2 million

Electrification rate: 73%

Urban electrification: 85%

Rural electrification: 60%

28 Lighting Asia: Solar Off-Grid Lighting – International Finance Corporation, PP 90,91
29 Country Lighting Assessment, UNEP/GEF en.lighten initiative (2010)
30 IEA, Statistics: Electricity and Heat 2011 & 2010, http://www.iea.org/
31 Country Lighting Assessment, UNEP/GEF en.lighten initiative (2010)
32 IEA, World Energy Outlook, 2013
33 Lighting Asia: Solar Off-Grid Lighting – International Finance Corporation, PP 82

3.2.1 Regulatory and Control Mechanisms

National Standardization Agency of Indonesia (Badan Standardisasi Nasional - BSN), was established in 1997, as a government institution with the responsibility of developing and promoting national standardization in Indonesia. It is a member body of International Standards Organization (ISO). The agency took over the functions and duties of the Standardization Council of Indonesia.[34]

The government has also passed the Energy Law in 2007 to shift focus from oil to alternative sources, such as natural gas and renewables.

3.2.1.1 Energy Performance Standards

Indonesia has MEPS[35] for compact fluorescent lamps which have been developed based on Standards National Indonesia and other technical standards on energy performance testing standards. However, there are no energy performance standards for off-grid lighting system.

3.2.2 Economic and Market-Based Instruments

3.2.2.1 Rural Electrification Program[36]

The Indonesia Government rural electrification program was started in 1997 as '50 MWp project' to cover off-grid parts of the country. Government procures solar home systems from local companies and distributes them to households for free. The procurement is carried out through tenders/ bids which include the cost of installation and training of the users by the suppliers.

An estimated 260,000 solar home systems have been installed under this scheme but the market penetration is just 1.3 per cent. There are many obstacles to overall success of the scheme, including lack of ownership by beneficiaries, lack of after-sale maintenance services and inadequate monitoring and evaluation by the implementing agencies.

3.2.2.2 TERI Solar Multi Utility (SMU) Program[37]

TERI in partnership with PT Azet has piloted a program since 2009 based on the Light a Billion Lights rental program in India and currently has three installations in Bandung province. The program seeks to leverage the large number of solar panels lying idle in the country as a result of failed government programs. By leveraging this infrastructure, individual solar multi utilities[38] would generate electricity to charge approximately 10 lanterns and provide lighting to 10 households. Each of solar multi utility would be managed by a local entrepreneur who would receive a daily rental fee for renting out lanterns (currently $ 0.10-0.15/ lantern/ day) and would also provide after-sales services. TERI believes that there is potential to set up 200,000 solar multi-utilities in the country at a cost of $ 90 million (the cost/ solar multi utility is $ 450). TERI believes that this model will address the issue of inefficient after-sale services today and mobilize local banks to provide

34 Indonesia, Member, ISO, http://www.iso.org
35 Currently under review.
36 Lighting Asia: Solar Off-Grid Lighting – International Finance Corporation, PP 83
37 Lighting Asia: Solar Off-Grid Lighting – International Finance Corporation, PP 84
38 A solar multi utility is a platform that utilizes locally available solar energy to generate electricity through solar photovoltaic technology

financing to companies and entrepreneurs. The aim is to scale up the operations and bring light to 2 million Indonesian households by 2015.

3.2.3 Fiscal Instruments and Incentives

3.2.3.1 Tax Incentives[39]

There is no import duty on solar lanterns and duties on solar lanterns and charge controllers is in the range of 5-10 per cent which encourages local assembly of Solar Home System.

3.2.3.2 Grants, Subsides and Loans[40]

As a part of rural electrification program, around 260,000 numbers of 50 Wp solar home systems with a 6W fluorescent and a 70 Ah lead acid battery were distributed for free.

3.2.4 Monitoring, Verification and Enforcement Activities[41]

The various organisations responsible and various on-going MVE activities for off-grid lighting system in Indonesia is as explained below

- Directorate General of New-Renewable Energy and Energy Conservation under The Ministry of Energy and Mineral Resources is responsible for efficiency policy development, efficiency standards and labelling, market monitoring, financial incentives, as well as training and international cooperation.
- The Ministry of Trade is responsible for ensuring that all lighting products on the market have the energy efficiency label and is also responsible for market surveillance.
- There are six national testing laboratories in Indonesia with facilities to test lighting products. Five of which are accredited:
    - B4T - Center for Material and Technical Products
    - P3TEK - Centre for Research and Technological Development of Electricity and Renewable Energy
    - Central Laboratory Operations Cibitung, Sucofindo PT (Persero)
    - Product Quality Testing Center of Jakarta (BMPBEI)
    - Lab. Kalibrasi Baristand Industri
- The National Accreditation Body of Indonesia awards accreditation to certification bodies and third party Conformity Assessment Bodies involved in certification, inspection, testing and calibration.
- All compact fluorescent lamps must be energy labelled and supported with test results from an accredited laboratory

Currently regulations are being drafted to define the MVE framework for lighting products only and it doesn't include other components (Solar photovoltaic, battery) of off-grid lighting system. For lighting products, there are no market surveillance programs to check the compliance. Testing procedures and specifications for testing of lamps are in the development phase. The enforcement guidelines are in the development phase.

39 Lighting Asia: Solar Off-Grid Lighting – International Finance Corporation, PP 85
40 Lighting Asia: Solar Off-Grid Lighting – International Finance Corporation, PP 83
41 UNEP Policy Status report on Lighting MVE activities in Southeast Asia

3.2.5 Production and Manufacturing

There are some companies that manufacture solar photovoltaic modules locally, such as PT Len and Sundaya; otherwise almost the entire demand for photovoltaic modules is met through imports. However, batteries, charge controllers and DC lamps are produced locally.

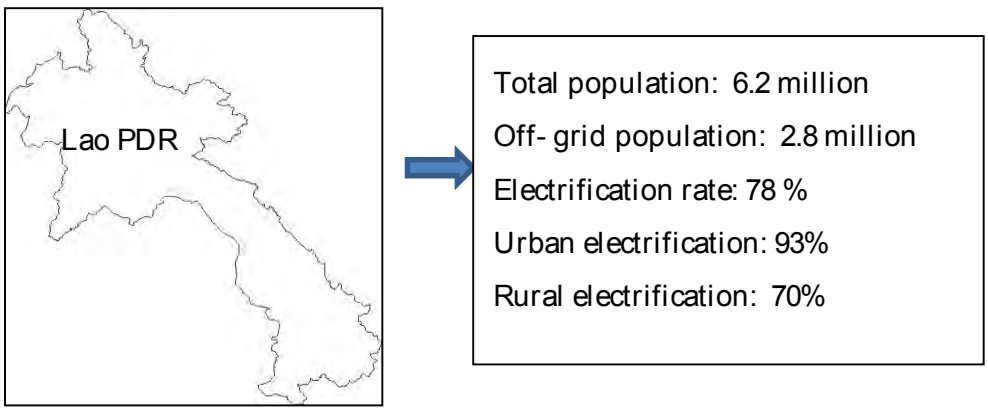
3.2.6 Benefits of Transition to Efficient Off-grid Lighting Systems[42]

For Indonesia, the transition to efficient off-grid lighting systems would result in a saving of around 2 billion litres of kerosene, 1.10 billion numbers of candles, 270 million batteries which would result in saving around $792 million every year. The initial cost for installation of efficient off-grid lighting systems would be recovered in 23 months. In terms of climate change, there is a potential of reducing the CO_2 emissions by around 5,500 thousand tonnes/ year.

3.3 Lao PDR[43]

Lao PDR is the only land locked country in Southeast Asia, bordered by Myanmar, China, Viet Nam and Cambodia. Its thickly forested landscape consists majorly of rugged mountains, plains and plateaus. Due to diverse geographical conditions Lao PDR generates most of its electricity through hydropower having a potential of 26,000 MW and installed capacity of 1,804 MW[44] The total population of Lao PDR is 6.2 million, of which more than 45 per cent do not have access to electricity [45]. The urban electrification rate in Lao PDR is 93 per cent whereas the rural electrification rate is 70 per cent[46].

The Lao PDR government has the stated intention to connect about 90 per cent of households to the national grid by 2020[47]. Most of the households which do not possess access to electricity lie in either mountainous regions or in villages which are located far from populated centres. The main delivery model for rural electrification in Lao PDR is through grid extension; however renewable energy sources, such as wind, solar photovoltaic, hydro etc. are gaining ground[48].



42 Country Lighting Assessment, UNEP/GEF en.lighten initiative (2010)
43 Martin S, Susanto J, "Supplying power to remote villages in Lao PDR –The role of off-grid decentralised energy options", Energy for Sustainable Development 19 (2014) 111–121
44 http://eneken.ieej.or.jp/data/3841.pdf, PP: 3
45 Country Lighting Assessment, UNEP/GEF en.lighten initiative (2010)
46 IEA, World Energy Outlook, 2013
47 Martin S, Susanto J, "Supplying power to remote villages in Lao PDR –The role of off-grid decentralised energy options", Energy for Sustainable Development 19 (2014) 111–121
48 Martin S, Susanto J, "Supplying power to remote villages in Lao PDR –The role of off-grid decentralised energy options", Energy for Sustainable Development 19 (2014) 111–121

3.3.1 Regulatory and Control Mechanisms[49]

3.3.1.1 National Policy Framework

Policies for renewable energy promotion have been developed. Government provide various incentives to investors generating clean energy to meet domestic requirements. Details of the policies are as explained below:

- **Promotion and development of small hydropower**: hydropower is the most abundant energy source in Lao PDR and promoting small hydropower could play important role in meeting the country's objective of increasing rural electrification from 70 per cent to 90 per cent by 2020.
- **Promotion and development of solar energy:** Solar energy can play important role in meeting the country's objective of promoting off-grid lighting in the rural area. To promote the use of solar energy above all other forms of energy Government promotes development of solar energy in following service areas:
    - Provide lighting services through the installation of solar home systems in rural and remote areas which do not have access to the national grid;
    - Support the development of the solar energy business in the country for the installation of large-scale grid connected solar energy systems and hybrid systems and for the provision of energy services in off-grid areas;
    - Promote the use of solar energy in water and space heating for households and commercial installations;
    - Promote the use of solar energy in productive uses such as drying agriculture produce, etc.

3.3.2.1 Energy Performance Standards[50]

At present there are no standards for energy performance of off-grid lighting products. However, it has been reported that Lao PDR plans to develop their efficient off-grid lighting regulations if donor support can be access to progress this.

3.3.2 Economic and Market-Based Instruments[51]

The government programs for rural electrification are mainly financed by international organisations such as Asian Development Bank and World Bank. Also countries like China and India have funded a few projects provided that the materials are purchased from these donor countries.

The World Bank group is directly contributing $83.0 million to connect about 200,000 households under the Rural Electrification Phase I&II of Rural Electrification Adaptable

49 Martin S, Susanto J, "Supplying power to remote villages in Lao PDR –The role of off-grid decentralised energy options", Energy for Sustainable Development 19 (2014) 111–121
50 Primary research
51 Renewable Energy Development Strategy in Lao PDR 2011, Lao Institute of Renewable Energy, http://www.lao-ire.org

Program Lending program. The program aims to provide clean energy in the areas which are not grid connected and the details of the program are explained below

3.3.2.1 Phase I -Rural Electrification Adaptable Program Lending Program[52]

The project was started in August 2006 with the support from World Bank with the dual objectives of increasing access to electricity of rural households in villages of targeted provinces and improving financial performance of the power sector. By July 2011, 51,625 households in 570 villages have been electrified through grid extension as against the target of 50,000 households in 540 villages by March 2012. By May 2011, 14,081 households have been electrified by solar housing systems in 230 villages as against the target of 14,000 households in 200 villages by March2012. Due to major price escalations in 2007-08, there was a financing gap which was met by Australia bilateral assistance (AusAID) which had provided additional financing of $9.42 million. This additional financing had increased the project targets by 25 per cent and 50 per cent for grid extension and off-grid electricity respectively.

Phase II-Rural Electrification Adaptable Program Lending Program

The objective of the second phase (approved in January 2010) of the Global Environment Facility (GEF) rural electrification project is

- To increase access to electricity of rural households in villages of project provinces.
- Improve the financial performance of Electricity du Laos (EDL, state cooperation of LAOS that owns and operate the electricity generation, transmission and distribution assets)

Activities include improving energy efficiency in both electricity supply and consumption, promoting adoption of renewable energy in the government's rural electrification Program, and support project implementation.

3.3.2.2 Renewable Energy Development in Remote Communities[53]

The project was approved in April 2011 with support from the Asian Development Bank and Japan Fund for Poverty Reduction. The project aims to assist the Government of Lao PDR in pursuing its ambitious target of electrifying 80 per cent of villages and 90 per cent of households by 2020. The project also aims at capacity building which would involve communities in the operation and maintenance of off-grid schemes.

3.3.3 Fiscal Instruments and Incentives[54]

3.3.3.1 Tax incentives

Lao PDR Government provides tax incentives on the following:

- Free import duty on production machinery, equipment, raw materials and on chemicals required for production of biofuels within a time limit of seven years.

52 Rural Electrification Phase I Project of the Rural Electrification (APL) Program, http://www.worldbank.org/projects
53 Asian Development Bank Projects
54 Renewable Energy Development Strategy in Lao PDR 2011, Lao Institute of Renewable Energy, http://www.lao-ire.org

- Profit tax is divided into three categories 20 per cent, 15 per cent, 10 per cent and exemptions are available depending upon the size of investment, area and activity for renewable energy generation

However, currently there are no tax incentives for off-grid lighting products.

3.3.3.2 Grants, Subsides and Loans

No financial programs are in place for off-grid lighting. However, to promote the development of generation of electricity through Renewable energy, the Government came up with a renewable energy fund as a sub account to the existing Rural Electrification fund. This fund is sourced from Government, International organisations and from various NGO's.

3.3.4 Monitoring, Verification and Enforcement Activities[55]

The various organisations responsible and various on-going MVE activities for off-grid lighting system in Lao is as explained below

- Department of Energy Management under Ministry of Energy and Mines is responsible for drafting energy related laws, regulations, guidelines and technical and safety standards
- There are no Laboratories for testing of lamps and other off-grid lighting components and Lao relies on the results of the testing done at the countries of import. Lao doesn't have a legal framework in place for ensuring the use of only authorised tested off-grid lighting components.

3.3.5 Production and Manufacturing

Most of the lighting products and other equipment are imported from neighbouring countries like China, Viet Nam etc. There are no manufacturing facilities in Lao PDR for off-grid lighting products.

3.3.6 Benefits of Transition to Efficient Off-grid Lighting Systems[56]

For Lao PDR, the transition to efficient off-grid lighting systems would result in a saving of around 66 billion litres of kerosene, 36 billion numbers of candles, 9 million batteries which would result in saving around $81 million every year. The initial cost for installation of efficient off-grid lighting systems would be recovered in six months. In terms of climate change, there is a potential of reducing the CO_2 emissions by around 44.90 thousand tonnes/ year.

3.4 Philippines

In the Philippines, renewable energy accounts for 29 per cent of energy usage in the country. Emphasis has been laid on reducing the dependence on coal and oil, which are the major sources of energy and promoting non-conventional sources of energy like waste and biofuels. These two sources, in particular, have witnessed an increase of 200 per cent and 450 per cent in their share in total energy consumption in the country (in 2011 as compared to

55 UNEP Policy Status report on Lighting MVE activities in Southeast Asia
56 Country Lighting Assessment, UNEP/GEF en.lighten initiative (2010)

2010). Solar energy still has a long way to go as its share in total energy consumption in less than 0.1 per cent.[57]

The total population of the Philippines is 93.3 million, of which more than 10 per cent do not have access to electricity [58]. The urban electrification rate is 80 per cent whereas the rural Electrification rate is 52 per cent[59].

Off-grid areas have been dominated by the operations of the Small Power Utilities Group (SPUG)[60] but a majority of them are dependent on diesel based power generation.[61]

Total population: 93.3 million
Off- grid population: 9.6 million
Electrification rate: 70 %
Urban electrification: 80%
Rural electrification: 52%

3.4.1 Regulatory and Control Mechanisms[62]

The Philippines Department of Energy and Department of Trade and Industry have a joint program, Philippine Energy Standards and Labelling program, which requires appliances and lighting products to meet minimum energy efficiency levels as prescribed. The main objective of the program is to eliminate the use of least efficient household appliances and lighting products in the local market.

Renewable Portfolio Standards have been introduced by the Department of Energy, mandating distribution companies to buy a certain amount of electricity from renewable energy sources. However, it is not clear if it is for both off-grid and on-grid renewables.

Also, under the Renewable Energy Act 2008 (RA 9513), it is mandatory for energy suppliers to source a certain amount of energy from renewable sources as prescribed by the National Renewable Energy Board. In case of absence of any renewable energy resources, the supplier is obligated under the Renewable Portfolio Standards.

57 IEA, Statistics: Electricity and Heat 2011 & 2010, http://www.iea.org/
58 Country Lighting Assessment, UNEP/GEF en.lighten initiative (2010)
59 IEA, World Energy Outlook, 2013
60 Under Section 70 of the Republic Act 9136, the Small Power Utilities Group (SPUG) is responsible for providing power generation and its associated power delivery systems in areas that are not connected to the grid and cannot be serviced by distribution utilities and other qualified third parties. National Power Corporation (2014). Accessed 27 August 2014 at www.napocor.gov.ph/index.php/spug
61 IEA, World Energy Outlook, 2013
62 Department of Energy, Republic of Philippines, http://www.doe.gov.ph

3.4.1.1 Energy Performance Standards

Minimum energy performance standards for compact fluorescent lamps and linear fluorescent lamps were introduced in 2010[63] but the Department of Energy is yet to prescribe performance standards for off-grid lighting appliances.

3.4.2 Economic and Market-Based Instruments

3.4.2.1 Rural Power Project[64]

Rural Power Project is the first phase of an Adaptable Program Loan (APL) by the World Bank to the Philippine Government. The project was initiated in December 2003 and the total cost of the project is $233 million, with Phase 1 costing $27 million. The primary objective of the project is improvement in the quality of life of the rural people by providing them with affordable, adequate and efficient energy services. Major components of the project include rural electrification, capacity building and credit risk guarantee.

3.4.2.2 Project Alliance for Mindanao Off-grid Renewable Energy (AMORE)[65]

The Alliance for Mindanao Off-grid Renewable Energy (AMORE) Program is a partnership of governments, principally of the United States through the United States Agency for International Development and of the Philippines through the Department of Energy, and private sector partners from the energy industry such as the former Mirant Philippines Foundation and Sun power Corporation, and is administered by Winrock International, a United States-based non-profit organization.

The program is presently in Phase 3 (2009 onwards) while the first two phases covered the period from 2002 to 2009. The major objective of the program is to bring energy services to remote, conflict affected communities in rural Mindanao, the second largest island of Philippines. These communities are located kilometres away from grid electricity and are served through stand-alone renewable energy technology such as solar photovoltaic and micro hydro systems. The AMORE Program hopes to develop vibrant renewable energy market linkages in Mindanao, beginning in the 474 AMORE villages.

3.4.2.3 Philippine Rural Electrification Service Project[66]

The Philippine Rural Electrification Service Project (PRES) is being proposed through the French Filipino Loan Protocol financing amounting to some 17.5 million Euro ($24 million). The project aims to improve the living conditions of the residents in Masbate by providing them adequate and reliable energy services. About 18,000 households located in 128 barangays[67] shall benefit from the project.

3.4.2.4 Solar Power Technology Supports Project[68]

The Department of Agrarian Reform undertakes the Solar Power Technology Supports Project (SPOTS) aimed at addressing poverty in the un-energized and off-grid agrarian reform communities through the introduction of appropriate solar photovoltaic applications

63 Eighth lites.asia meeting, 2013,Policies on Energy Efficiency Standards and labelling in Philippines, Manila, Philippines
64 Rural power project, http://www2.doe.gov.ph/rpp
65 http://www.amore.org.ph
66 Department of Energy, http://www.doe.gov.ph
67 Barangays are the smallest administrative divisions in the Philippines and is the native term for a village, district or a ward.
68 https://www1.eere.energy.gov/solar/pdfs/39081.pdf

for agricultural and rural enterprise. One of the project components was solar electrification which involves provision of variety of solar packages (i.e., home lighting, alternating current power supply systems for various agribusiness uses, level II potable water pumping and lighting of public facilities such as barangay halls, school buildings, health centers, and, streets). Phase 1 of the project covered 16 provinces in Mindanao and Phase 2 benefitted 55,000 households distributed in 15 provinces in Mindanao (2005-2007).

3.4.2.5 Solar Home System Distribution Project[69]

The Philippine National Oil Company implemented the Solar Home System Distribution Project with fund support from the Dutch Government. The project was implemented from 2002-2007 and was completed in December of 2007, installing all the 15, 100 solar home systems units all over the Philippines. The Dutch Government provided a 60 per cent grant to the total system cost and the remaining 40 per cent was shouldered by the end-users.

3.4.2.6 Liter of Light - MyShelter Foundation[70]

Philippines based, MyShelter Foundation developed an innovative idea in 2011 of using plastic bottles to light up homes not connected to grid electricity. It makes use of salt, water and bleach. Water is used to refract the light, salt prevents rapid evaporation and bleach prevents mould from growing in the bottle. The organization aims to light up 1 million homes by 2015 across the globe.

3.4.3 Fiscal Instruments and Incentives

3.4.3.1 Tax Incentives[71]

Import duty on solar home systems is very low Also, Renewable Energy Law 2008 provides incentives, such as seven year income tax holiday, corporate tax at 10 per cent, ten year exemption from tariff duties, duty free importation of renewable energy machinery, equipment and materials within the first 10 years.

3.4.3.2 Grants, Subsides and Loans[72]

Various internationally funded projects are being implemented with funding from different sources. In addition, the Department of Energy has shown keen interest in providing access to energy in off-grid areas and adequate subsidies and Public Private Partnership (PPP) initiatives have been taken. Project Alliance for Mindano off-grid renewable Energy Program funded by USAID (AMORE), Program of the French Filipino Loan Protocol, Implemented by the Filipino company Pamtec (PRES), Program of the Department of Agrarian Reform (DAR) and British Petroleum (BP) (SPOTS), Rural power project Funded by World Bank (RPP) are some of these projects which have funding from the government, private sector as well as international agencies.

Grants are also given for free distribution of solar home systems and in addition to this a *lease to own* model for the purchase of solar home systems has been introduced. Through this model 40,000-50,000 solar home systems have been deployed so far in the country.

69 www.pnoc.com.ph
70 http://aliteroflight.org/about-us/
71 Chapter VII (General Incentives), Republic Act No. 9513, Department of Energy, republic of Philippines, https://www.doe.gov.ph/issuances/republic-act/627-ra-9513
72,59 Lighting Asia: Solar Off-Grid Lighting – International Finance Corporation, pp 100

3.4.3.3 Subsidies[73]

Government provides subsidies of $180 on a 20-30 Wp and $90 on a 30-50 Wp range solar home systems and does not provide anything for systems above 50 Wp under the Rural Power Project.

3.4.4 Monitoring, Verification and Enforcement Activities[74]

The various organisations responsible and various on-going MVE activities for off-grid lighting system in Philippines is as explained below

- Department of Energy in coordination with Department of Trade and Industry (DTI) is responsible for implementation of energy standards and labelling.
- There are three testing laboratories in Philippines with facilities to test lighting products. Two of which are accredited:
    - IIEE Foundation Inc. Testing Laboratory
    - Scientific Environmental and Analytical Laboratory and Services, Inc. (SEALS)

  The Department of Energy's Energy Research and Testing Laboratory Services is responsible for the verification (through quality and efficiency testing) of lighting products. Currently Energy Research and Testing Laboratory Services laboratory does not have training and capacity for testing of light emitting diodes. However, it is currently awaiting a decision on a $13 million project proposal on standards development for light emitting diode products and associated training and laboratory testing capacity.
- Under the National Renewable Energy Plan – 2011-30, launched by the Department of Energy, there are proposals to set up a solar photovoltaic laboratory, solar photovoltaic institute and solar photovoltaic codes and standards within the time stipulated in the plan.
- The Bureau of Products Standards under the Department of Trade and Industry has regulatory responsibility for the lighting labelling and is in charge of the monitoring and enforcement activities in cooperation with Energy Research and Testing Laboratory Services
- The Bureau of Customs, under the Ministry of Finance, is responsible for the control of the products entering the national market.
- Compact fluorescent lamps, linear and circular fluorescent lamp and fluorescent lamp ballasts for sale in the Philippines must meet prescribed energy efficiency levels and carry an energy label at the point of sale. All products covered by the energy labelling program in the market must carry Import Commodity Clearance (ICC) or the Philippine Standard (PS) license marks.
- A registration system is in place for lighting products covering the energy label, MEPS, the Import Commodity Clearance and Philippine Standard marks for compact fluorescent lamps, linear and circular fluorescent lamp ballasts The Department of Trade and Industry administers the processing of applications for these marks and the Department of Energy administers the processing of requests for validation of energy labels. During the product certification process, a sample of the products selected at random from the manufacturer's production line or the importer's warehouse is tested by Energy Research and Testing Laboratory Services

68 Lighting Asia: Solar Off-Grid Lighting – International Finance Corporation, PP 100
74 UNEP Policy Status report on Lighting MVE activities in Southeast Asia

for compliance. To qualify for registration, laboratory test reports for compliance to safety and performance standards must be submitted, along with an approved request for validation of the energy label.

- Currently there is no legal framework in place for MVE for lighting products and other components of off-grid lighting system. However, a budget is in place for MVE activities. Market surveillance program for checking products is managed and implemented by Department of Energy and Department of Trade and Industry. However there is currently no documented protocol for this conducting this activity and market monitoring activities are carried out on an ad hoc basis.
- At present, there is no programme for performance testing of lighting products and other off-grid lighting components.
- The Philippines has a legal framework in place for authorising the enforcement of non-compliance, the responsible agency for which is the Department of Trade and Industry, the administrators being the Undersecretary of the Regional Operations Group and Undersecretary of the Consumer Protection Group. Where non-compliance is found, all non-conforming or non-complying goods/ products must be withdrawn (or are removed) from the premises of the establishment

3.4.5 Production and Manufacturing

Currently, there are very few manufacturers (e.g. Gendiesel, First Philec, Pamtec, Del Genta Philippines, Adtel Energy, Hystra Philippine) in the Philippines which have the capabilities to manufacture off-grid lighting components.

3.4.6 Benefits of Transition to Efficient Off-grid Lighting Systems[75]

For the Philippines, the transition to efficient off-grid lighting systems would result in a saving of around 221 billion litres of kerosene, 121 billion numbers of candles, 30 million batteries which would result in saving around $270 million every year. The initial cost for installation of efficient off-grid lighting systems would be recovered in seven months. In terms of climate change, there is a potential of reducing the CO_2 emissions by around 598.30 thousand tonnes/ year.

3.5 Thailand

The total population of Thailand is 66.8 million, of which only 1 per cent does not have access to electricity [76]. The urban electrification rate in Thailand is 100 per cent whereas the rural electrification rate is 99 per cent[77]. In absolute numbers, approximately 1 million people do not have access to grid electricity. This population is mainly concentrated in the border areas, particularly near the Thai-Myanmar border.[78]

The major factor of success in providing access to grid electricity to the people is the sustained efforts of the government for the last two and a half decades. Thailand has attractive schemes that encourage people to move to renewable energy and a few NGOs are working intensively in remote areas.[79]

---

75 Country Lighting Assessment, UNEP/GEF en.lighten initiative (2010)

76 Country Lighting Assessment, UNEP/GEF en.lighten initiative (2010)

77 IEA, World Energy Outlook, 2013

78 IEA, World Energy Outlook 2013

79 Addressing the Electricity Access gap (background paper for the World Bank Group Energy sector strategy – June 2010)

Use of solar photovoltaic as a share of total energy produced in the country has increased by about 5 times from 20 GWh in 2010 to 95 GWh in 2011. Use of biofuels and hydro power has increased considerably but major dependence is on coal, oil and gas, which together account for more than 90 per cent of electricity generation in the country.[80] Nearly 70 per cent of electricity generation is from natural gas.[81]

Total population: 66.8 million

Off- grid population: 1 million

Electrification rate: 99 %

Urban electrification: 100 %

Rural electrification: 99 %

3.5.1 Regulatory and Control Mechanisms

Thai Industrial Standards Institute was established as a department under the Ministry of Industry in 1969. Its primary objective is to carry out national standards development and product certification in order to promote development of Thai products to the acceptable quality and to ensure preservation of environment as well as awareness and protection of consumers.[82]

3.5.1.1 Energy Performance Standards

Thailand has both minimum energy performance standards and high efficiency performance standards which are set up and regulated by three organizations, viz. Thai Industrial Standards Institute, Electricity Generating Authority of Thailand and the Department of Alternate Energy Development and Efficiency.[83]

In both the cases, standards are set up by Department of Alternative Energy Development and Efficiency. Minimum energy performance standards are regulated by the Thai Industrial Standards Institute, while high energy performance standards are regulated by both the Department of Alternative Energy Development and Efficiency and Electricity Generating Authority of Thailand. Thailand is currently targeting development of minimum energy performance standards for more than 50 different appliances, machines and equipment including light emitting diode and compact fluorescent lamps.[84] Off-grid lighting products are not included in this list of products.

80 IEA, Statistics: Electricity and Heat 2011 & 2010, http://www.iea.org/
81 Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy
82 ISO members, http://www.iso.org
83 Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy
84 Energy Efficiency Standards and Labelling in India, ICF International, http://www.icfi.com

3.5.2 Economic and Market-Based Instruments

3.5.2.1 National Plan for Thailand Accelerated Rural Electrification[85]

Electrification is one of the top priorities in the developmental plan of Thailand. The government envisioned access to electricity to all people in rural areas in the early 1970s. Government of Thailand adopted the National Plan for Thailand Accelerated Rural Electrification in 1973 which was implemented by the Provincial Electricity Authority. The plan was divided into five year plans in line with the five year national economic and social development plans of the country which ensured a comprehensive development. This rate of access to energy grew from 20 per cent in 1976 to 98 per cent in 1996.

The funds were mobilized from various sources in many ways. Financial grant from government, end user contribution, elements of cost recovery and cross subsidies were used to finance the plan.

3.5.2.2 Small Power Producer and Very Small Power Producer Programmes[86]

In 1992, Thailand introduced the Small Power Producer programme. It obliged the Energy Generating Authority of Thailand to purchase power from power plants that generate power through combined heat and power plant or through renewable sources, under transparent and predictable power purchase agreements. Power plants with a capacity to export up to 60 MW to the grid – later increased to 90 MW – were eligible. In 2001, a Very Small Power Producer programme was introduced for plants with an export capacity of up to 1 MW (later increased to 10 MW). Very small power producers benefited from simplified regulations and were able to sell power directly to the distribution companies – the Metropolitan Electricity Authority and Provincial Electricity Authority.

In 2006, the government further streamlined the procedures and introduced the 'Adder'. The Adder is a feed-in premium paid to small power producers and very small power producers using renewable energy on top of the avoided cost rate. It ranges from around 8 to 21 US cents per kilowatt hour (kWh) and is paid for 7–10 years, depending on the technology. It is funded through a small surcharge per kWh paid by all electricity consumers. The Adder is technology specific, reflecting differences in generation cost. For example, the Adder for solar energy is higher than for biomass. An additional premium is paid to projects that replace diesel generators in remote areas or are located in three southern provinces.

3.5.2.3 SunSawang Initiative[87]

SunSawang was a nongovernmental organization that aimed to implement and repair solar systems the Thai government bought in 2004 for the remote countryside. But when the government stopped providing solar panels, SunSawang decided to buy them themselves and handle their installation and maintenance. SunSawang now offers individual solutions to off-grid households. It trains villagers to become technicians so they can install and repair the systems locally.

85 GNESD, Energy access knowledge base, http://www.energy-access.gnesd.org/
86 Climate and Development Knowledge Network, http://www.cdkn.org
87 http://www.cartierwomensinitiative.com/candidate/salinee-tavaranan

3.5.3 Fiscal Instruments and Incentives

3.5.3.1 Tax Incentives[88]

The following tax incentives have been offered by the Thailand Board of Investments:

- Corporate income tax holidays of up to 8 years
- Import duty reductions or exemptions on equipment and raw material
- Double deduction of public utility costs
- Deductions for infrastructure construction/ installation costs

The Board of Investment has identified 'Renewable Energy and Environmental Services' as a target industry in their new investment strategy that is to be effective from 2015. This will include new incentives for renewables sector. However off-grid lighting products do not qualify under these schemes.

3.5.3.2 Grants, Subsides and Loans[89]

The Government of Thailand is providing subsidies for energy efficiency measures with a ratio of 20:80 and 30:70, with an upper ceiling of 3 million baht ($93,000) per project. The majority of this is to buy high energy efficiency products for replacing older machines and equipment, for which the payback period would be less than 7 years. The designated buildings and industries can receive 20 percent, but non-designated buildings and industries (SMEs) are eligible for 30 per cent of the total cost, excluding tax. However, there are no subsidies for off-grid lighting system

3.5.4 Monitoring, Verification and Enforcement Activities[90]

Spot checks of products carrying the energy efficiency label are carried out by the Electricity Generating Authority of Thailand. Random models are purchased from electric appliances shops and department stores countrywide and sent to the government-owned laboratory at the Thai Industrial Standards Institute to be tested for compliance against the relevant test method standard.

3.5.4.1 Product Quality Testing Laboratories

Presently there are three facilities providing standard testing services for specifications and compliance tests for solar photovoltaic components and other electronic products. They are:

- Clean Energy Systems Solar Cells Testing Center, King Mongkut's University of Technology Thonburi, Bangkok
- Electrical and Electronic Product Testing Center, National Electronics and Computer Technology Center
- Electrical and Electronics Institute, Ministry of Industry

The government-owned laboratory at the Thai Industrial Standards Institute is the accredited laboratory for lighting products. A private accredited laboratory, Intertek, also provides facilities for testing lighting products. However, testing of off-grid lighting system is yet to be started.

88 Industrial Efficiency Policy Database, http://iepd.iipnetwork.org/policy/tax-incentives
89 http://iepd.iipnetwork.org/policy/energy-efficiency-revolving-fund-eerf
90 Lites.Asia: National Standards and Labels

3.5.5 Production and Manufacturing [91]

Thai firms like Solartron Public Company Limited and Ekarat Solar recognize the dire need for off-grid systems to provide electricity to remote areas. Some of the off-grid installations done by these are as explained below:

- Solartron's installations for off-grid water pumping systems in rural areas range between 0.8 to 2.1 kilowatts.
- Ekarat's larger-scale project, solar electrical system for village education centers in rural areas, was 60 kilowatts. Their largest project as of now is the five megawatts solar farm project in Prachuap Khiri Khan, on Thailand's East Coast.

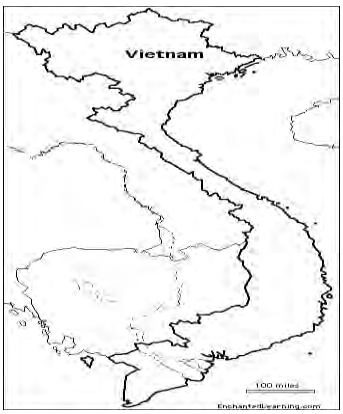
There are other companies in the country, like Bangkok Solar, ENVIMA, Solar Power Technology Company, etc., which are manufacturing photovoltaic kits but they have not yet specialised in the off-grid systems.

3.6 Viet Nam

Viet Nam has put a lot of emphasis on the development of their National Grid. The total population of Viet Nam is 86.9 million, of which only 2 per cent do not have access to electricity [92]. The urban electrification rate in Viet Nam is 100 per cent whereas the rural electrification rate is 94 per cent[93]. The Viet Nam Master Power Plan VII clearly states that there are still 818,947 households not connected to grid and lacking access to electricity.[94]

Viet Nam is located on the eastern Indochina peninsula between the latitudes 8 degrees and 24 degrees north and the longitudes 102 degrees and 110 degrees east thus making it home to diverse natural resources which could be used as renewable energy generation sources such as wind, solar, hydro and even geo thermal energy.

At present approximately 1,000 wind power plants, about 7,000 solar photovoltaic and around 120,000 micro and Pico hydro power generation systems in off-grid areas are funded by a combined support from Government and other international bodies, however only a few of them are operating at full efficiency mainly due to technical failure. [95]



Total population: 86.9 million

Off- grid population: 2.1 million

Electrification rate: 96 %

Urban electrification: 100 %

Rural electrification: 94 %

91 http://www.pv-magazine.com/archive/articles/beitrag/opportunities-in-asia-_100001174/86/?tx_ttnews%5BbackCat%5D=133&cHash=a620ab839e9dccfa48296f13853933a7#axzz3CzDV35kd-

92 Country Lighting Assessment, UNEP/GEF en.lighten initiative (2010)

93 IEA, World Energy Outlook, 2013

94 USAID Vietnam, Clean Energy program- Off-grid Opportunities and Challenges in Vietnam, PP5

95 USAID Vietnam, Clean Energy program- Off-grid Opportunities and Challenges in Vietnam

3.6.1 Regulatory and Control Mechanisms

The Ministry of Industry and Trade, a government body of Viet Nam responsible for advancement, promotion and growth of industry and trade, has introduced legislation to implement minimum energy performance standards with the support of Australian government Department of Resource Energy and Tourism which is providing assistance through Viet Nam Energy Efficiency Standard and Labelling program (VEESL).[96]

3.6.1.1 Energy Performance Standards

Voluntary minimum energy performances for linear fluorescent lamps and compact fluorescent lamps are currently in place. Minimum energy performance standards for off-grid system based lamps are not available.

3.6.2 Economic and Market-Based Instruments

3.6.2.1 National Policy Framework

The Government of Viet Nam has built a clear policy framework with a set rule of principles for enhancing off-grid generation. In the Master Power Plan VII (2011-2020), the strategy to develop and create rural power supply is indicated.

Government will also simulate Electricity of Vietnam (the national electricity company of Vietnam) to develop national power grid to supply electricity to 100 per cent households. In case the areas are not capable of accessing the grid electricity, the government will provide financial support in developing the local power resource for 100 per cent electrification

The Rural Electrification Project (REII) is expected to fund such developments.[97]

3.6.2.2 Internationally Funded Projects[98]

3.6.2.2.1 Joint UNDP and World Bank Energy Sector Management Assistance Program (ESMAP)

The objective of this program, which is in operation since 2001, was to provide reliable electricity to rural people to improve their standard of living. The renewable energy was supplied to isolated household and communities that could not be reached economically by grid supply. The program focused for potential market segment for renewable energy and gave priority to energy services in poor isolated societies.

3.6.2.2.2 Viet Nam Sweden Rural Energy Program (VSRE)

This Program was launched by the Swedish international Development Agency and the Ministry of Industry and Trade to enhance the pace of off-grid electrification in rural Areas mainly through solar photovoltaic and bio-gas. The program was implemented during 2004-2009 and has met its targets which included conducting numerous assessments of the capacity and renewable energy potential of rural areas across Viet Nam. It also included

96 Vietnam energy Efficiency and labelling program www.energyrating.gov.au/
97 USAID Vietnam, Clean Energy program- Off-grid Opportunities and Challenges in Vietnam
98 USAID Vietnam, Clean Energy program- Off-grid Opportunities and Challenges in Vietnam

developing a new technology standard for rural electrification which was formally adopted in 2006 as a national standard to replace the localized standards.

3.6.2.2.3 Renewable Energy Development and Network Expansion and Rehabilitation for Remote Communes Sector project

The program, funded by Asian Development Bank, aims to build on the foundation developed by the Viet Nam Sweden Rural Energy Program to deploy hydropower in rural areas. The program was initiated in 2009.

3.6.2.2.4 Sustainable Business Model to Deliver Clean Energy in Rural Viet Nam

This project is funded by World Vision Australia and Renewable Energy and Energy Efficiency Partnership, aims at providing 100MWh supply from renewable energy per year to two or more villages and at generating awareness amongst the people about renewable generation of electricity. The program is currently ongoing and the duration of the program is between 2013 and 2014.

3.6.2.2.5 Solar Energy Project

The Finnish government has funded EUR5.3 million for a project on solar energy application in rural areas and localities inhabited by ethnic minority people in Vietnam. The government of Vietnam will contribute EUR1 million in reciprocal capitals for the project worth over EUR6 million in the first phase.

At the initial, the project helped on applying solar energy in 17 mountainous communes and localities inhabited by ethnic minority people in Ky Son, Que Phong and Quy Chau districts in the central province of Nghe An. An additional 283 communes in Nghe An province were also in the plan for solar energy development.

3.6.3 Fiscal Instruments and Incentives[99]

3.6.3.1 Tax Incentives

Currently, there are no tax incentives or import duty concessions for energy efficient equipment or services or off-grid lighting products.

3.6.3.2 Grants, Subsides and Loans

Currently there are no financial mechanisms or incentives that specifically target energy efficiency initiatives or off-grid lighting products.

3.6.4 Support, Information and Voluntary Action Policies

Under the national energy efficiency program, Electricity of Vietnam along with GEF launched the Compact Fluorescent Lamp Program to procure and sell 100,000 compact fluorescent lamps to rural and residential customers over a period of three years.[100] Viet Nam government also implemented two programs (*Phasing out Incandescent Lamps through Lighting Market Transformation in Vietnam* and *Vietnam Energy Efficiency Public Lighting*

99 USAID Vietnam, Clean Energy program- Off-grid Opportunities and Challenges in Vietnam
100 Project Brief: Vietnam: Demand-Side Management and Energy Efficiency Project (GE-P071019) , PP21

Project) to support the lighting manufacturers in the technology transition from incandescent to compact fluorescent lamps.[101]

3.6.5 Monitoring, Verification and Enforcement Activities[102]

The various organisations responsible and various on-going MVE activities for off-grid lighting system in Vietnam is as explained below

- Ministry of Industry and Trade is responsible for standards and labelling and conducts market surveillance, product performance testing and enforcement activities. Within the Ministry of Industry and Trade, the Office for Energy Efficiency and Conservation is responsible for certifying products and managing labelling
- Viet Nam has two public accredited laboratories for lighting products - Technical Center for Standards and Quality 1 (QUATEST 1) and Technical Center for Standards and Quality 3 (QUATEST 3).
- To qualify a lighting product for mandatory labelling, the manufacturer or supplier must register each batch or lot of products and supply a test report from an the Ministry of Industry and Trade approved independent laboratory or the manufacturer must be certified by the Ministry of Industry and Trade inspectors. The Ministry of Industry and Trade must be advised of any changes to the design of the model if it impacts on energy performance, and provide a new independent test report.
- The compliance regime being developed by the Viet Nam Energy Efficiency Standards and Labelling Program also includes the development of a strategic plan for verification testing. This will be managed by Office for Energy Efficiency and Conservation within the Ministry of Industry and Trade.
- Under the current system, if complaints are received, the Ministry of Industry and Trade is required to send samples of the product to the General Department of Energy for testing (Circular 7). Further samples of products may be requested and tested. Where a product fails to meet the required standard, the supplier must pay for the testing costs and carry the cost of rectifying the situation.

Viet Nam has a legal framework in place for authorising the enforcement of non-compliance and the Viet Nam Energy Efficiency Standards and Labelling Program will establish relevant enforcement policies, procedures and staff manuals. The enforcement process is administered by the Ministry of Industry and Trade. 3.5.5 Production and Manufacturing[103]

Viet Nam has manufacturing capabilities for CFL's with three main suppliers manufacturing 29 million lamps for domestic use per year. With the support from National Program on Energy Efficiency and Conservation and Ministry of industry and Trade, Viettronics Thuduc Limited Company (VTD), member unit of Vietnam Electronics and Informatics Corporation (VEIC) developed and put into operation light emitting diode producing facility in Vietnam

101 National standards and labels, country profile: Vietnam, lites asia, PP 13
102 UNEP Policy Status report on Lighting MVE activities in Southeast Asia
103 http://www.lites.asia/files/otherfiles/0000/0113/National_Standards_and_Labels_-_Vietnam_23_June_2012.pdf, PP 16

3.6.6 Benefits of Transition to Efficient Off-grid Lighting Systems[104]

For Viet Nam, the transition to efficient off grid lighting systems would result in a saving of around 50 billion litres of kerosene, 27 billion numbers of candles, 7 million batteries which would result in saving around $60.04 million very year. The initial cost for installation of efficient off-grid lighting systems would be recovered in six months. In terms of climate change, there is a potential of reducing the CO_2 emissions by around 133.90 thousand tonnes/ year.

104 Country Lighting Assessment, UNEP/GEF en.lighten initiative (2010)

4.0 Off-grid Lighting Status in the Pacific Countries

Common initiatives on Off-grid Lighting in the Pacific Countries

Details of various initiatives on off-grid lighting which are common in various countries of the Pacific region are as explained below.

The details of other initiatives on off-grid lighting which are specific to country are explained later in the chapter under sections of the Pacific countries.

Promoting Energy Efficiency in Pacific (PEEP)[105]

In 2007, the Pacific Alliance for Sustainability on behalf of the Global Environment Facility (GEF) conducted a consultation process under which five developing Pacific countries, the Cook Islands, Papua New Guinea, Tonga, Samoa and Vanuatu, agreed on reducing their fossil fuel consumption. The Asian Development Bank (ADB) agreed to provide regional technical assistance to these countries and helped them to access the potential for reducing their fossil fuel consumption through demand side energy activities, PEEP is been implemented in two phases:

- Phase I:-focuses on identifying a pipeline of specific energy efficiency projects for funding and co-funding by ADB, GEF, the Government of Australia and the Government of Japan.
- Phase II: - focuses on energy efficiency in the use of electrical power for consumers in the five participating islands.

Phase I was concluded in May 2011. Phase II of the project commenced on 6th November 2011 and is planned to be completed by 5 the November 2014.

Pacific Islands Renewable Energy Project (PIREP)[106]

South Pacific Regional Environment Programme with the support from United Nations Development Programme proposed the facilitation of widespread implementation and commercialization of renewable energy technologies in the various Pacific nations(Vanuatu, Tuvalu, Tonga, Solomon Islands, Samoa, Papua New Guinea, Palau, Niue, Nauru, Marshall Islands, Kiribati, Fiji, Federated States of Micronesia, Cook Islands) through the funding provided by UNDP- Global Environment Facility. The project has a regional approach to reflect the existing regional set-up and to improve the policy-making abilities of these small nations.

Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP) [107]

This project, funded by the United Nations Development Programme (UNDP) along with Global Environment facility, is aimed at reducing greenhouse gas emissions from the fossil fuels used in Pacific through their widespread and cost effective use of renewable energy

105 http://www.ee-pacific.net/index.php/about-us1/background
106 http://www.adaptationlearning.net/project/pirep-pacific-islands-renewable-energy-project
107 http://www.adaptationlearning.net/project/pacific-islands-greenhouse-gas-abatement-through-renewable-energy-project-piggarep

resources. The main focus nations under this programme were Tuvalu, Tonga, The Cook Islands, Solomon Islands, Samoa, Papua New Guinea, Niue, Nauru, Kiribati and Fiji. The PIGGAREP is a –follow up to the preparatory Pacific Islands Renewable Energy Project (PIREP). The PIREP was completed in 2006 and the implementation of the PIGGAREP commenced in 2007. The specific objective of the project is the promotion of the productive use of renewable energy to reduce greenhouse gas emission by removing the major barriers to the widespread and cost-effective use of commercially viable renewable energy technologies. It is estimated that successful implementation of the PIGGAREP will reduce CO_2 emissions by at least 30% by 2015.

North Pacific ACP (African, Caribbean and Pacific) Renewable Energy and Energy Efficiency Program (North-REP) [108]

The North Pacific ACP (African, Caribbean and Pacific) Renewable Energy and Energy Efficiency Project (North-REP) is a special and unique programme where three of Secretariat of Pacific Community member countries and territories (the Federated States of Micronesia, Palau and Republic of Marshall Islands) pooled their combined 14.4 million Euro of European Development Fund (EDF) 10 resources, which they have been identified for the development of their energy sectors.

Pacific Islands Energy Policy and Strategic Planning (PIEPSAP) [109]

Pacific Islands Energy Policy and Strategic Planning is a co- financed project by the Danish Government under European Energy Initiative and United Nations Development Programme's thematic trust fund 'Energy for Sustainable Development' Participating islands were the Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Republic of Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. The main outcomes of the project are:

- National energy policies were developed and endorsed at cabinet level.
- Practical national strategic plans to implement policies have been adopted and integrated in to the government budgetary process.
- Understanding of energy efficiency was enhanced at regional level.
- Opportunities for reliable, affordable and environmentally sound energy sector investment are in line.

Pacific Environment Community (PEC) Fund [110]

In May 2009, the Government of Japan provided funding of almost US$66 million to the member countries of Secretariat of Pacific Community[111] (Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Niue, Nauru, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu). Under this, each country is provided with an indicative allocation of US$ 4 million to support projects which focus on solar power generation and sea water desalination plant.

108 http://www.spc.int/northrep/
109 http://ict.sopac.org/VirLib/PI0081.pdf
110 http://www.forumsec.org/pages.cfm/strategic-partnerships-coordination/pacific-environment-community-pec- fund.html
111 http://www.forumsec.org/pages.cfm/about-us/

Pacific Alliance for Sustainability[112]

The long term goal of the proposed GEF-Pacific Alliance for Sustainability (GEF-PAS) is to increase the efficiency and effectiveness of GEF support to Pacific Island Countries, thereby enhancing achievement of both global environmental and national sustainable development goals. This project is active in all the fourteen member countries of the Secretariat of the Pacific Community. Since 1941, GEF has allocated US$86 million to support various projects in these member countries.

The Project for Introduction of Clean Energy by Solar Electricity Generation System[113]

This project is implemented in various member countries of Secretariat of the Pacific Community by the grant provided by Japan International Cooperation Agency. These member countries were supported financially and technically in the implementation of renewable energy generation projects. Countries which achieved this grant were Tonga, Kiribati, Federated States of Micronesia, Palau, and Republic of Marshall Islands.

Green Micronesia Initiative[114]

The Green Micronesia Initiative is a sub-regional initiative which was launched in 2010 and was headed by the Chief Executives of the Micronesian governments. This initiative aims to increase energy efficiency and energy conservation by 20 per cent and expand usage of renewable energy (up to 30 per cent by 2020).

World Bank's Sustainable Energy Finance Project[115]

The World Bank's Sustainable Energy Finance Project aims at improving and expanding the usage of renewable energy in the country by providing incentives and subsidies on the use of renewable energy and also encouraging local financing bodies to provide funding for this particular project.

Pacific Region Infrastructure Facility (PRIF)[116]:

The PRIF partners are working with other development partners and organisations in the region to provide support for increased and equitable access to reliable and affordable energy. This includes exploring options for extensions to existing networks and supporting off-grid solutions for local generation that can provide rural populations with reliable access to energy.

A number of energy initiatives are currently being coordinated through PRIF including the World Bank-led energising the Pacific initiative which has established a forum for donor coordination for more effective programming of energy sector assistance in the Pacific.

- In Tuvalu, the New Zealand Ministry of Foreign Affairs and Trade (NZMFAT) is assisting Tuvalu Electricity Corporation in establishing Renewable Energy and Energy Efficiency Unit (REEEU) Aim of this project is to help Tuvalu in reducing its dependence on imported diesel, reduce carbon emissions, improve the efficiency of

112 http://iwlearn.net/iw-projects/3420/project_doc/gef-pacific-alliance-for-sustainability-ppg/view
*113*http://www.irena.org/documentdownloads/OkinawaMay2012/04_Hiroshi%20Sumiyoshi_JICA.pdf , PP 13
114 http://www.reegle.info/policy-and-regulatory-overviews/FM, Energy Procedure
115 http://www.worldbank.org/projects/P098423/sustainable-energy-finance-project?lang=en
116 http://www.theprif.org/index.php/infrastructure/sectoral-approaches/107-energy

power generation and supply, increase the operational effectiveness of the TEC, and develop a plan for infrastructure development for greater use of solar and wind based energy generation.

- In Solomon Islands, Department of Foreign Affairs (DFAT), the European Investment Bank (EIB), IFC and the World Bank are working together with the Solomon Islands Government for the preparation of the Tina River Hydro Project. The activity includes feasibility studies, capacity strengthening and transaction advisory services to develop a hydropower IPP (10-22 MW) to replace a significant share of the diesel-powered generation in Honiara.
- In Vanuatu, DFAT(Department of Foreign Affair and Trade) and the World Bank are working with the Government of Vanuatu to prepare an energy roadmap for the country and are currently coordinating with the Vanuatu Ministry of Finance and Ministry of Lands and Energy to support the overall planning and implementation of the energy roadmap for a least-cost program of grid and off-grid access expansion

Promoting Access to Renewable Energy in Pacific[117]

The Technical Assistance is working with ADB's recently published Pacific Approach (2010-2014), which highlights the role of renewable energy in reducing dependence on fossil fuels and lowering greenhouse gas emissions. The Pacific Approach Framework also identifies the energy sector as one of the top four operational priorities for the region. The estimated cost is around $3.6 million of which $3.0 million will be financed as a grant by the Multi-Donor Clean Energy Fund under the Clean Energy Financing Partnership Facility and administered by ADB. The governments of Papua New Guinea, Solomon Islands, and Vanuatu will provide an in-kind contribution of $600,000 or $200,000 each. It is active in Papua New Guinea, Solomon Islands, and Vanuatu and the main outputs will be

- the completed design of small pilot projects for testing technology and management approaches in the first 8 months (phase 1) to be executed and completed under this TA in the second phase;
- the completion in phase 2 of a number of pilot projects for mini hydropower in PNG, alternative fuels in Solomon Islands, and solar power in Vanuatu, and,
- the completion of preparatory work for scaling up mini hydropower in PNG and Solomon Islands, alternative fuels in Solomon Islands, and renewable energy sources in Vanuatu in phase 2.

Biomass Resource Assessment[118]

This project aim at preparing a training manual and associated training materials for biomass resource assessment in the following countries of Pacific Fiji, Kiribati, Samoa, Tonga, Tuvalu & Vanuatu and shifting the focus on use of biomass for generating electricity rather than burning fuel. This program plan to achieve the laid objective by following the below listed steps:

- Preparing individual country biomass resource assessment report.
- Preparing a regional synthesis report for biomass resource assessment.

117 http://www.adb.org/sites/default/files/projdocs/2009/42465-REG-TAR.pdf, pp, 2 and 3

118 http://sopaccompendium.spc.int/data/Reports/TR0365.pdf

- Preparing individual country biomass resource development master plan.

Pacific Islands Climate Change Action Program (PICCAP)[119]

In 2005 the Pacific leaders endorsed the Pacific Islands Framework for Action on Climate Change (PIFACC).

The purpose of this Framework is to strengthen climate change action in the region by:

- raising awareness of climate change issues in the Pacific (for stakeholders within the Pacific and outside the region);
- providing guidance on design and implementation of climate change measures (both national and regional);
- providing guidance on development of national and regional sustainable development strategies, sector policies, climate change-specific policies, or their equivalent; providing a framework to enable measurement of progress of climate change action in the region

This Framework is intended to inform the decisions and actions of national, regional and international partners, and seeks to mainstream climate change into regional and national policies and plans across specific sectors, including: disaster risk management, water, waste management, agriculture, energy, forestry and land use, health, coastal zone management, marine ecosystems, ocean management, tourism, and transport.

By strengthening climate change action in the region, this Framework will help in access to adequate, predictable and sustainable resources to address climate change in pacific Island Countries and Territories (PICTs) including Samoa, Cook Islands, Fiji Islands, French Polynesia, Guam, Kiribati, Commonwealth of the Northern Marianas, Marshall Islands, Federated States of Micronesia, Nauru, New Caledonia, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, Wallis and Futuna.

Promotion of Renewable Energy and Energy Efficiency (PREGA)[120]

Promotion of Renewable Energy and Energy Efficiency was started in 2002 with funding from the Dutch Cooperation Fund and is currently in second phase. The main objective of PREGA is to promote investments in renewable energy, energy efficiency and greenhouse gas abatement technologies in developing member countries that will

- increase access to energy services by the poor
- realize other strategic development objectives
- help reduce greenhouse gas emissions

PREGA will

- develop capacities of national policymakers, technical experts, and staff of financing institutions for promoting renewable energy, energy efficiency and greenhouse gas abatement
- support policy, regulatory, and institutional reforms, including removal of energy pricing distortions

119 http://www.sprep.org/attachments/Publications/PIFACC-ref.pdf
120 http://www.adb.org/site/funds/funds/dutch-cooperation-fund-promotion-renewable-energy-and-energy-efficiency

- facilitate access to private sector financing

PREGA covers Samoa and other developing countries.

4.1 Cook Islands[121]

Cook Islands consist of 15 islands widely dispersed over an area of 2,000,236 sq. km. The population rate of the islands has been declining at a very fast rate due to continuous migration to countries like New Zealand and Australia. [122]As recorded in 2011, the total population was around 17,791 individuals. Energy consumption in Cook Islands mainly depends on imported fossil fuels, which accounts for about 99 per cent of the total energy consumption of the islands. According to the power sector, around 97 per cent households in Cook Islands are connected to grid supply with 100 per cent grid connection in Rarotonga, the most populous island of the group and home to the capital Avarua, with 2–3 hours of supply in Aitutaki, Mangaia, and Atiu islands. The rest of the islands have access to small scale power supply.[123]

4.1.1 Regulatory and Control Mechanisms [124]

Power production and distribution in Rarotonga is managed by Te Aponga Uira O Timmu te Varovaro, a government-owned utility. On the other islands, utility companies are managed by the local government.

4.1.1.1 Energy Act

The Energy Act specifies and assigns duties and responsibilities within the government regarding policy formation for renewable energy usage, planning, and formulating energy efficiency standards and laws.

4.1.1.2 National Energy policy

The Cook Islands National Energy Policy came into action in the year 2003. It aims to 'facilitate reliable, safe, environment acceptable and cost-effective sustainable energy services'. It also includes a strategic plan with activities, target agencies, and indicators to success.

4.1.1.3 Energy Performance Standards

Energy performance standards for lamps and off-grid lighting systems have not been defined.

4.1.2 Economic and Market-based Instruments[125]

Many of the islands have some household photovoltaic system for lighting and radio operation already installed. The largest standalone photovoltaic project (46 kWp) was installed for the electrification of Pukapuka in 1992. This was funded by the French government and electrified almost 160 households and public systems.

121 http://www.irena.org/DocumentDownloads/Publications/Cook-Islands.pdf, PP 1
122 http://www.ee-pacific.net/index.php/database/country-information/cook-islands, Table 1
123 http://www.spc.int/edd/en/download/finish/11-reports/649-cook-islands-country-profile
124 http://www.spc.int/edd/en/download/finish/11-reports/649-cook-islands-country-profile
125 http://www.irena.org/DocumentDownloads/Publications/Cook-Islands.pdf

4.1.2.1Renewable Energy Chart and Implementation Plan

The Cook Islands Renewable Energy Chart was published in 2012. It acts as the country's renewable energy roadmap which aims to achieve the government's target of fully electrifying the Cook Islands by the year 2020.

4.1.2.2 Renewable Energy Development Division

The Renewable Energy Development Division is assigned the duty of creating awareness about the country's renewable energy policy targets and plans.

4.1.2.3 National Renewable Energy Committee

The National Renewable Energy Committee has a role of leading and directing project initiatives arising from the Renewable Energy Chart and also verifying the deployment of various renewable energy technologies of the country.

4.1.2.4 National and International initiatives/ programs on off-grid lighting

The various initiatives by government/ international organisations on off-grid lighting system in Cook Island are as mentioned below and the details of these initiatives are provided in earlier section ''Initiatives on Off-Grid lighting in Pacific Countries''

- Promoting energy Efficiency in Pacific (PEEP)
- Pacific island Renewable Energy project Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP)
- Pacific Environment Community (PEC) Fund
- Pacific Islands Energy Policy and Strategic Planning (PIEPSAP)
- Pacific Alliance for Sustainability
- Pacific Islands Climate Change Action Program (PICCAP)

4.1.3 Fiscal Instruments and Incentives

Information on tax incentives and subsidies is not available.

4.1.4 Support, Information, and Voluntary Action Policies

Information on any activities related to training and demonstration projects on renewable energy and off-grid lighting products is not available.

4.1.5 Monitoring, Verification, and Enforcement Activities

No monitoring, verification, and enforcement policies are active at present.

4.1.6 Production and Manufacturing

There is no production of off-grid lighting system components in The Cook Islands. All products are imported from other countries.

4.2 Federated States of Micronesia[126]

Federated States of Micronesia is an independent sovereign island nation with a land cover of about 702 sq. km. According to the Pacific Region Information System's (PRISM) projection in 2009, about 103,629 people resided on this island. Federated States of Micronesia depends on imported petroleum fuel for its energy generation. According to the 2000 census report, 46 per cent of the households in Federated States of Micronesia are connected to grid supply.

4.2.1 Regulatory and Control Mechanisms[127]

The Department of Economic Affairs is the body responsible for formulating national policies and plans for renewable energy generation in the country. Development of the National Energy Policy started in 2008 and the policy draft was prepared by the Federated States of Micronesia Energy Division in late 2009. The National Energy Policy has a framework that builds upon the National Energy Objective to 'promote sustainable social and economic development of the Federated States of Micronesia through the provision and utilization of cost-effective, safe, reliable and sustainable energy practices'. Some of the major goals of the policy are listed below:

- Having an increased share of renewable energy sources;
- Cross-sectorial energy conservation; and
- Making energy standards to be in place and thus by 2020 fulfilling the aim of government of having 100 per cent electrification throughout the island.

4.2.1.1 Energy Act

The Federated States of Micronesia does not have any Energy Act. In 2009, the Federated States of Micronesia drafted energy legislation involving an energy policy and action plan. This was finalized and submitted to the Federated States of Micronesia congress in 2010. A revised version was again submitted in 2011 with endorsement in 2012.

4.2.1.2 Energy Performance Standards

Energy performance standards for lamps and off-grid lighting systems have not been defined.

4.2.2 Economic and Market-Based Instruments[128]

4.2.2.1 Strategic Development Plan 2004–20

The Strategic Development Plan includes the following references to energy:

- Reduce the import and use of imported petroleum fuels to 50 per cent by 2020, through improved energy efficiency, energy conservation, elimination of energy subsidies, and public education;
- Ten per cent of electricity in urban centres and 50 per cent in rural areas will be generated using renewable energy sources (solar power, wind, and/ or solar/ wind hybrids) by 2020, through incentives and public education;

126 http://www.spc.int/edd/en/document-download/finish/11-reports/794-fsm-country-profile, PP3
127 http://www.reegle.info/policy-and-regulatory-overviews/FM

128 http://www.reegle.info/policy-and-regulatory-overviews/FM

- Upgrade local capacity to carry out operation and maintenance of all renewable energy hardware;
- One-hundred per cent of new public and 50 per cent of private buildings in the Federated States of Micronesia will meet the US standards for energy-efficiency by 2006.

4.2.2.2 Pohnpei Power Sector Development Project[129]

Phonepi power sector development power project was initiated to support the development of power system of Phonepi State and to reduce its energy dependency on fossil fuels by expanding and enhancing the generation through renewable means.

4.2.2.3 National and International initiatives/ programs on off-grid lighting

The various initiatives by government/ international organisations on off-grid lighting system in Federated States of Micronesia are as mentioned below and the details of these initiatives are provided in earlier section ''Initiatives on Off-Grid lighting in Pacific Countries''

- Green Micronesia Initiative
- North Pacific ACP (African, Caribbean and Pacific) Renewable Energy and Energy Efficiency Program (North-REP) Pacific Island Renewable Energy Project
- Pacific Islands Energy Policy and Strategic Planning (PIEPSAP)
- Pacific Environment Community (PEC) Fund
- Pacific Alliance for Sustainability
- The Project for Introduction of Clean Energy by Solar Electricity Generation System
- Pacific Islands Climate Change Action Program (PICCAP)

4.2.3 Fiscal Instruments and Incentives

Information on tax incentives and subsidies is not available.

4.2.4 Support, Information, and Voluntary Action Policies

Information on any activities related to training and demonstration projects on renewable energy and off-grid lighting products is not available

4.2.5 Monitoring, Verification and Enforcement Activities

No monitoring, verification, and enforcement policies are active at present.

4.2.6 Production and Manufacturing

There is no production of off-grid lighting system components in Federated States of Micronesia. All products are imported from other countries.

4.3 Fiji[130]

The total population of Fiji is 0.9 million out of which 0.1 million do not have access to grid electricity. The government owned Fiji Electricity Authority has pursued a strategy of

129 http://www.adb.org/projects/45112-001/details
130 http://luminanet.org/forum/topics/country-data-fiji#.U-BZ2_mSyG4

investment in renewable energy to move away from oil-based electricity generation.[131] Fiji Electrical Authority operates four electricity grids having a peak load of 138 MW and supplies electricity to over 74 per cent of the Fiji's population.[132]

4.3.1 Regulatory and Control Mechanisms[133]

The Department of Energy is the government body responsible for activities in the energy sector. These activities include development and review of appropriate framework, coordination, and consultation within the energy sector and other sector. The Department of Energy focuses on four strategic areas for enhancing sustainable energy in Fiji —– energy security, energy planning, power sector, and renewable energy.

4.3.1.1 Energy Act

Fiji does not have an Energy Act. However, the following policies and legislation guide the energy sector administration:

- National Energy Policy and Action Plan 2006;
- Rural Electrification Policy 1993 allows Fiji's Department of Energy to undertake the administration and control of the rural electrification programme;
- Electricity Act (Ca. 1980);
- Petroleum Act (Cap. 190);
- Fuel and Power Emergency Act (Cap. 191);
- Public Enterprise Act, 1996;
- Commerce Act, 1998; and
- Electricity Reform Bill, 1998; Environment Management Act, 2005; Public–Private Partnership Act, 2006; and the Renewable Energy Service Company Bill, 2004.

4.3.1.2 National Energy Policy 2006[134]

The overall goal of Fiji's National Energy Policy is to maintain an efficient, cost-effective, and environmentally sustainable energy sector in Fiji. This policy has four strategic areas covering energy efficiency, energy security, renewable energy, and power sector reform. The power sector reform includes establishment of renewable energy service companies and increases funding for rural electrification programs.

4.3.1.3 Energy Performance Standard[135]

Energy performance standards for lamps and off-grid lighting systems are not defined.

131 http://ageconsearch.umn.edu/bitstream/100544/2/Dornan.pdf
132 http://ageconsearch.umn.edu/bitstream/100544/2/Dornan.pdf
133 http://www.fdoe.gov.fj/
134 http://www.irena.org/DocumentDownloads/Publications/Fiji.pdf
135 http://www.fdoe.gov.fj/index.php/energy-security/energy-conservation-efficiency/mepsl

4.3.2 Economic and Market-based Instruments

4.3.2.1 Promoting Renewable Energy Technology and Renewable Energy Services[136]

The Promoting Renewable Energy Technology and Renewable Energy Services (FRESCO) project is funded by the Global Environmental Facility (GEF). It aimed at removing barriers to the implementation of renewable energy for rural electrification in Fiji. This project involved development of a regulatory framework to provide the legal and economic guidelines required for the establishment of sustainable renewable energy service companies.

4.3.2.2 The Fiji Renewable Energy Power Project (FREPP)[137]

The Fiji Renewable Energy Power Project is a part of the GEF Pacific Alliance for Sustainability Programme. It aims at removing major barriers to the widespread and cost-effective use of grid-based renewable energy supply, with the help of commercially available renewable energy technology. The project aimed at facilitating investments on energy products and initiation of 100 per cent electrification of Fiji.

4.3.2.3 Sustainable Energy Financing Project (SEEP)[138]

SEEP, is a government initiative launched with assistance from The World Bank. The SEEP aims to make renewable energy and energy-efficient equipment more affordable for the people who need it most whether it be individuals, communities, private businesses, rural or urban. The SEEP supports three renewable energy technologies namely solar photovoltaic, pico-hydro, and coconut oil for generating electricity.

4.3.2.4 National and International initiatives/ programs on off-grid lighting

The various initiatives by government/ international organisations on off-grid lighting system in Fiji are as mentioned below and the details of these initiatives are provided in earlier section ‘‘Initiatives on Off-Grid lighting in Pacific Countries’’

- Pacific Island Renewable Energy Project (PIREP)
- Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP)
- Pacific Islands Energy Policy and Strategic Planning (PIEPSAP)
- Pacific Environment Community (PEC) Fund
- Pacific Alliance for Sustainability Biomass resource assessment
- Pacific Islands Climate Change Action Program (PICCAP)

4.3.3 Fiscal Instruments and Incentives

There are zero fiscal and import duties on a wide range of renewable energy equipment including wind, hydro, and solar power. For biofuel energy generation there is duty-free concession for both plant and chemical required for biofuel manufacturer.

136 erc.undp.org/evaluation admin/download document. html?docid=1492
137http://www.fj.undp.org/content/fiji/en/home/operations/projects/environment_and_energy/Fiji_RE/
138 http://www.fdoe.gov.fj/index.php/power-sector/sustainable-energy-financing-project-sefp

4.3.4 Support, Information, and Voluntary Action Policies

4.3.4.1 Namara, Toyotal Island and Vatulele Solar project[139]

The first rural electrification project was carried out by DOE in 1983 using solar photovoltaic. The project was to install 100 solar home systems (SHS) with funding from USAID. The sites selected for installation were Namara, Toyota Island and Vatulele and each of the sites were provided with 30-40 SHS.

In year 1985, SHS for 20 households were installed at Namara through a funding of Fiji $30000 by Kadavu local government. In year 1994, SHS for 63 households were installed at Namara.

4.3.4.2 Solar Home System for Provinces of Bua, Cakaudrove, and Macuata[140]

Based on the survey carried out by the Department of Energy (DoE) in 2003, procurement of solar home system was done through various suppliers. The installation was started in year 2005. Survey was made for procurement of SHS

4.3.4.3 Naroi Photovoltaic Project[141]

Approximately Fiji $1m dollars of project funding was provided by the French Government through the French Embassy in 1998 to electrify the village of Naroi on the island of Moala using solar photovoltaic modules. The cost per household was Fiji $5469 including engineering, consultancy and support fees of international consultants.

In this project approximately 170 households were equipped with pre-payment metered, solar powered lighting systems. No power points were included for radio or other appliance operation. The project was completed in 1999.

4.3.4.4 Vanua Levu solar project[142]

Phase 1

The Pacific International Center for High Technology Research (PICHTR), a Hawaii based organisation, secured approximately FJ$ 100,000 from the Government of Japan for implementation of SHS on 60 households for Vunivau by the year 2000. The DoE allocated approximately F$30,000 for locally sourced materials and local costs, including treated wood poles, materials transport and engagement of local technicians for installation. Another local company, SOLCOM Fiji Ltd was engaged to supervise the installations.

Phase 2

In phase around 96 households (44 households near Nasua, 12 near Onelake and 40 near Vusasivo) were covered with a funding of around 200000 dollars by Japan and Fiji DoE. The project was started in July 2002 and was completed in December 2002

4.3.4.5 Future Plans for Solar Home Systems[143]

Presently, the Department of Energy is trying to identify funding for a two-phase project to be implemented over a ten-year period. Approximately 20,000 households could be served with solar home systems under the service model outlined. The Department of Energy's approach would be to obtain a grant or low interest loan to implement an initial 2,000

139 http://www.sids2014.org/content/documents/116Energy%20Strategy.pdf, pp50-51
140 http://www.fdoe.gov.fj/index.php/power-sector/solar-home-systems/shs-projects
141 http://www.sids2014.org/content/documents/116Energy%20Strategy.pdf, PP 88
142 http://www.sids2014.org/content/documents/116Energy%20Strategy.pdf, pp 59, 60 and 93
143 http://www.sids2014.org/content/documents/116Energy%20Strategy.pdf, pp50-51

systems under a Pilot Phase and after a few years of successful operation proceed to full implementation of 18,000 systems throughout the country.

4.3.5 Monitoring, Verification, and Enforcement Policies

No monitoring, verification, and enforcement policies are active at present.

4.3.6 Production and Manufacturing

There is no production of off-grid lighting system components in Fiji. All products are imported from other countries.

4.4 Kiribati

Energy consumption in Kiribati is concentrated in the Gilbert Group of islands, mainly in the capital island of Tarawa. Electrification is achieved through imported petroleum products and gas. The Kiribati Oil Company is the main company responsible for the import of liquid petroleum fuels in Kiribati.

Around 44 per cent of households in Kiribati, in terms of the power sector, are connected to the public grid network provided by the Public Utilities Board. The capital island of Tarawa has 87 per cent access to grid connected electricity and the rest of Kiribati is estimated at 4.8 per cent access. The overall contribution from solar energy in 2009 stood at 0.11 per cent.

4.4.1 Regulatory and Control Mechanisms

The Ministry of Public Works and Utilities is responsible for the planning, management, and coordination of the energy sector in Kiribati. The Energy Planning Unit is the main office under Ministry of Public Works and Utilities responsible for coordinating the implementation of energy policies and providing necessary advice and assistance on all energy activities and energy related matters.

The Public Utilities Board is a statutory authority responsible for the provision of power, water supply, and sewage services for South Tarawa, and the provision, operation, and maintenance of all assets associated with service delivery. The Kiribati Solar Energy Company is an incorporated company, majority-owned by the government, which provides electrical services for rural areas through the sale or lease of solar photovoltaic systems.

In 2009, Kiribati had endorsed their National Energy Policy. Public Utilities Board has a development plan and currently Kiribati is working on their energy sector plan.

4.4.1.1 Energy Performance Standard[144]

Energy performance standards for lamps and off-grid lighting systems have not been defined.

4.4.2 Economic and Market-based Instruments

4.4.2.1 National and International initiatives/ programs on off-grid lighting

The various initiatives by government/ international organisations on off-grid lighting system in Kiribati are as mentioned below and the details of these initiatives are provided in earlier section ‘‘Initiatives on Off-Grid lighting in Pacific Countries’’

144 http://www.fdoe.gov.fj/index.php/energy-security/energy-conservation-efficiency/mepsl

- Pacific island Renewable Energy Project (PIREP)
- Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP)
- Pacific Islands Energy Policy and Strategic Planning (PIEPSAP)
- Pacific Environment Community (PEC) Fund
- Pacific Alliance for Sustainability
- The Project for Introduction of Clean Energy by Solar Electricity Generation System
- Biomass resource assessment
- Pacific Islands Climate Change Action Program (PICCAP)

4.4.3 Fiscal Instruments and Incentives

No legislative framework is in place to regulate energy efficiency activities on importation issues. Demand side management is mentioned in the Kiribati National Energy Policy — ''Introduce appropriate incentive packages including taxes, duties, and tariffs to encourage efficient energy use''.

4.4.4 Support, Information, and Voluntary Action Policies

In Kiribati, 56 per cent of the electricity billed was accounted under the commercial and industrial customer consumption. With respect to renewable energy consumption, Kiribati Solar Energy Company is responsible for the rural solar electrification program and has distributed some 2,300 units of solar home systems. By estimation, energy consumption from solar energy accounted for 1.7 TJ, contributing to 0.11 per cent of total energy consumed in 2009 and providing small scale electrification to 31 per cent of households in Kiribati.

4.4.5 Monitoring, Verification, and Enforcement Activities

No monitoring, verification, and enforcement policies are active at present.

4.4.6 Production and Manufacturing

There is no production of off-grid lighting system components in Kiribati. All products are imported from other countries.

4.5 Nauru[145]

Nauru, officially known as Republic of Nauru, consists of a single raised coral island with a phosphate plateau in the centre, with a total land cover of about 21 sq. km. Total population of Nauru as per the PRISM projection in 2009 was around 9,771 people. About 99.95 per cent of the total energy consumed in Nauru is supplied from imported petroleum products (diesel and petroleum) and the rest by solar energy.

In 2008–09, through the Renewable Energy Performance (REP)-5 programme, power sector improvement strategies were undertaken which included energy-efficient activities covering energy auditing and awareness generation.

145 http://www.spc.int/edd/en/download/finish/11-reports/651-nauru-country-profile,PP 3

4.5.1 Regulatory and Control Mechanisms

The Ministry of Commerce, Industry, and Resource is a government body responsible for implementation of new National Energy Policy Framework. The National Utility Authority (, established in 2007, is a single body responsible for the energy sector.

Nauru has endorsed the United Nations Framework Convention on Climate Change (UNFCCC) and is an active participant in the Pacific Islands Climate Change Action Program (PICCAP). It is also a full member of an independent, intergovernmental, regional organization established by the South Pacific nations in order to provide geotechnical services also known as Secretariat of Pacific Community, and also a member of the Secretariat of the Pacific Regional Environment Programme (SPREP)

4.5.1.1 Energy Act

Nauru does not have any specific energy act or legislation in place. However, Nauru has a National Energy Policy Framework that was endorsed in 2008. There is also the Nauru National Sustainable Development Strategy (2005–25), which has associated energy targets and is the overall strategic guiding document for all sectors, including energy.

4.5.1.2 National Development Sustainable Strategy

The National Development Sustainable Strategy was announced in 2005. It aims at working over a span of almost 20 years. This policy aims at providing reliable, sustainable, and affordable energy to all through the implementation of National Policy Framework.

The main goals of the National Policy Framework are as listed below:

- Cost-effective, secure, and sustainable procurement and supply of fuel;
- Reliable and efficient energy supply and distribution;
- Management of demand focusing on consumption efficiency and conservation; and
- Increased use of renewable energy and other alternative forms of energy.

4.5.1.3 Energy Performance Standards

Energy performance standards for lamps and off-grid lighting systems are not defined.

4.5.2 Economic and Market-Based Instruments[146]

4.5.2.1 Nauru Energy Efficiency Training and Awareness Programme

The Nauru Energy Efficiency Training and Awareness Programme is a part of the national development sustainable strategy and has a primary objective of alleviating poverty by improving access to electricity and therefore ameliorating living conditions by improving demand side efficiency of the energy sector.

4.5.2.2 Energy Efficiency Action Plan (EEAP)

The Energy Efficiency Action Plan (EEAP) 2008–15 has been developed through a consultative process involving stakeholders from private, public, and civil sector aiming at improving energy efficiency. The EEAP aims at providing ‘secure and sustainable energy’, for the social and economic development of Nauru.

146 http://www.reegle.info/policy-and-regulatory-overviews/NR

4.5.2.3 National and International initiatives/ programs on off-grid lighting

The various initiatives by government/ international organisations on off-grid lighting system in Nauru are as mentioned below and the details of these initiatives are provided in earlier section ''Initiatives on Off-Grid lighting in Pacific Countries''

- Pacific Island Renewable Energy Project (PIREP)
- Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP)
- Pacific Islands Energy Policy and Strategic Planning (PIEPSAP)
- Pacific Environment Community (PEC) Fund
- Pacific Alliance for Sustainability
- Pacific Islands Climate Change Action Program (PICCAP)

4.5.3 Support, Information, and Voluntary Action Policies

Information on any activities related to training and demonstration projects on renewable energy is not available.

4.5.4 Fiscal Instruments and Incentives

Information on tax incentives and subsidies is not available.

4.5.5 Monitoring, Verification, and Enforcement Activities

No monitoring, verification, and enforcement policies are active at present.

4.5.6 Production and Manufacturing

There is no production of off-grid lighting system components in Nauru. All products are imported from New Zealand and Australia

4.6 Niue[147]

Niue includes an elevated ring-shaped coral reef rising about two terraces from the sea level, covering a total area of about 259 sq. km and total population of about 1,514 people as recorded in 2009. Energy consumption in Niue depends on imported fossil fuels which contribute to about 99 per cent of the total energy consumption. About 99 per cent of the households in Niue are connected to grid supply provided by Niue Power Corporation. In terms of renewable energy generation, three grid connected solar photovoltaic systems with a generating capacity of 52.5 kWp have already been installed under the Renewable Energy Programme (REP)-5 program.

4.6.1 Regulatory and Control Mechanisms[148]

Niue Power Corporation, a government-owned organization, has the right to sell and generate electricity in Niue. At present there is no department allocated for energy efficiency management in Niue.

147 http://www.spc.int/edd/en/download/finish/11-reports/652-niue-country-profile, PP 3
148 http://www.reegle.info/policy-and-regulatory-overviews/NU

4.6.1.1Energy Act

Niue does not have any comprehensive energy sector legislation. Energy activities are mainly driven by project funding or are guided by the National Energy Policy.

4.6.1.2 National Energy Policy

The Niue Energy Policy has the following sub-sectoral policy statement:

- **The Electricity Sector:** 'Establish and maintain an efficient, semi-autonomous, and commercially-orientated power corporation —– the Niue Power Corporation (NPC) —– that is able to provide an on-going, cost-effective, affordable, user-friendly, and reliable electricity supply to meet the developing demand for electricity in its areas of service.
- **New and Renewable Sources of Energy:** 'Promote low-carbon energy options for power generation including solar, wind, and biomass energy resource; and assess and promote the natural resource potential and improve the technical capacity to meet Niue's energy needs.
- **Energy Conservation and Efficiency:** 'Minimize Niue's energy demand and consumption without adversely affecting Niue's economic and social well-being; and maximize the efficiency with which energy is used.
- **Private sector:** To mobilize development assistance and financing from international and multilateral development partners and the private sector, for the implementation of national and regional energy strategies.

4.6.1.3 Energy Performance Standards

Energy performance standards for lamps and off-grid lighting systems are not defined.

4.6.2 Economic and Market-based Instruments[149]

4.6.2.1 Niue's Renewable Energy and Energy Efficiency Program

Niue's Renewable Energy and Energy Efficiency Program is supported by the European government. The European government provided funding of 2.55 million pounds to the Niue government for generating electricity mostly through renewable sources.

4.6.2.2 National and International initiatives/ programs on off-grid lighting

The various initiatives by government/ international organisations on off-grid lighting system in Niue are as mentioned below and the details of these initiatives are provided in earlier section ''Initiatives on Off-Grid lighting in Pacific Countries''

- Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP)
- Pacific Island Renewable Energy Project (PIREP)
- Pacific Islands Energy Policy and Strategic Planning (PIEPSAP)
- Pacific Environent Community (PEC) Fund
- Pacific Alliance for Sustainability

149 http://www.reegle.info/policy-and-regulatory-overviews/NU

- Pacific Islands Climate Change Action Program (PICCAP)

4.6.3 Fiscal Instruments and Incentives

Information on tax incentives and subsidies is not available.

4.6.4 Support, Information, and Voluntary Action Policies

Information on any activities related to training and demonstration projects on renewable energy is not available.

4.6.5 Monitoring, Verification, and Enforcement Activities

No monitoring, verification, and enforcement policies are active at present.

4.6.6 Production and Manufacturing

There is no production of off-grid lighting system components in Niue. All products are imported from New Zealand and other countries

4.7 Palau[150]

Palau consists of 200 islands of which nine are completely inhabited and more than 95 per cent lie within a spherical reef with a total land cover of about 488 sq. km. It has a total residing population of about 20,397. Around 99.9 per cent of Palau's energy consumption is supported by imported fossil fuels and about 99 per cent of the total households in Palau are grid connected. A 100 kWp solar photovoltaic is connected to the national grid.

4.7.1 Regulatory and Control Mechanisms[151]

The Palau Public Utility Corporation was established under legislation which mandates it to carry out generation and distribution activities within the country. The Department of Energy, falling under the Ministry of Public Works Department, is the body that is responsible for policy frameworks in the energy sector.

4.7.1.1 Energy Act

Up to 2009, Palau has developed its energy efficiency action plan but there was no comprehensive energy sector legislation in Palau. However in 2010, Palau has developed and endorsed its National Energy Policy and Strategic Action Plan

4.7.1.2 National Energy Policy 2009

Areas addressed in this policy are as listed below:

- The improvement of institutional arrangements for energy sector management and the creation of an energy administration to implement measures in the National Energy Policy and its related strategic action plan;
- A reduction in national energy consumption through energy efficiency measures, with a target of reducing total energy consumption by 30 per cent by 2020; and

150 http://www.spc.int/edd/en/download/finish/11-reports/654-palau-energy-country-profile, PP 3
151 http://www.reegle.info/policy-and-regulatory-overviews/PW

- A 20 per cent target for renewable energy contribution to the energy mix by 2020, as well as a reduction in the use of imported hydrocarbons.

4.7.1.3 Energy Performance Standards

Energy performance standards for lamps and off-grid lighting systems are not defined.

4.7.2 Economic and Market-based Instruments[152]

The European Commission has proposed 2.47 million Euros for development of renewable energy generation in Palau. The United Nations Development Programme has provided $4.4 million over the period of 2009–13 to support energy efficiency initiatives in the island, by addressing overall renewable energy generation potential of the country. The International Union for Conservation of Nature along with the National Development Bank of Palau has targeted energy consumption for households to be reduced by almost 15 per cent. In 2009, the Japan International Co-operation Agency (JICA) announced it would be financing the project for 'Introduction of Clean Energy by Solar Electricity Generation Systems' for the Government of Palau.

4.7.2.1 National and International initiatives/ programs on off-grid lighting

The various initiatives by government/ international organisations on off-grid lighting system in Palau are as mentioned below and the details of these initiatives are provided in earlier section "Initiatives on Off-Grid lighting in Pacific Countries"

- The Pacific Islands Energy Policy and Strategic Action Planning (PIEPSAP) project
- North Pacific ACP (African, Caribbean and Pacific) Renewable Energy and Energy Efficiency Program (North-REP)
- Pacific Island Renewable Energy Project (PIREP)
- Pacific Environment Community (PEC) Fund
- Pacific Alliance for Sustainability
- The Project for Introduction of Clean Energy by Solar Electricity Generation System
- Green Micronesia Initiative
- Pacific Islands Climate Change Action Program (PICCAP)

4.7.3 Fiscal Instruments and Incentives

Information on tax incentives and subsidies is not available.

4.7.4 Support, Information, and Voluntary Action Policies

Information on any activities related to training and demonstration projects on renewable energy is not available.

4.7.5 Monitoring, Verification, and Enforcement Activities

No monitoring, verification, and enforcement policies are active at present.

152 http://www.reegle.info/policy-and-regulatory-overviews/PW

4.7.6 Production and Manufacturing

There is no production of off-grid lighting system components in Palau. All products are imported from other countries

4.8 Papua New Guinea[153]

Papua New Guinea covers over 600 islands and is the largest island country in the Pacific, with a total land cover of almost 462,243 sq. km and a total population of about 6,339,000. It is the only country in the Pacific which produces crude oil. About
12 per cent of the households in Papua New Guinea are grid connected. Papua New Guinea Power Limited (PPL) is the largest electricity generating company in Papua New Guinea.

4.8.1 Regulatory and Control Mechanisms

Papua New Guinea Power is the government-owned body responsible for generation and distribution of electricity. The Energy Division of the Department of Petroleum and Energy (DPE) is the government body responsible for the policy framework in the energy sector.

4.8.1.1 Energy Act

There is no Energy Act for Papua New Guinea. As of 2009, the Energy Division had drafted two policy documents — a draft Energy Policy and a draft Rural Electrification Policy.

4.8.1.2 Energy Performance Standards

Energy performance standards for lamps and off-grid lighting systems have not been defined.

4.8.2 Economic and Market-based Instruments

4.8.2.1 Papua New Guinea Sustainable Development Program Limited (PNGSDP)

The main aim of Papua New Guinea Sustainable Development Program Limited (PNGSDP) is to promote sustainable development of Papua New Guinea through affordable and sustainable infrastructure, capacity-building, health, and education. The PNGSDP has hired Papua New Guinea Sustainable Energy Limited (PNGSEL) to manage the energy sector in the rural parts of the country.

4.8.2.2 National and International initiatives/ programs on off-grid lighting

The various initiatives by government/ international organisations on off-grid lighting system in Papua New Guinea are as mentioned below and the details of these initiatives are provided in earlier section ‘‘Initiatives on Off-Grid lighting in Pacific Countries’’

- The Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP)
- Promoting Energy Efficiency in the Pacific (PEEP)
- Promoting Access to Renewable Energy in the Pacific
- Pacific Island Renewable Energy Project (PIREP)

[153] http://www.spc.int/edd/en/document-download/finish/11-reports/835-pngcountryprofile, PP3

- Pacific Islands Energy Policy and Strategic Planning (PIEPSAP)
- North Pacific ACP (African, Caribbean and Pacific) Renewable Energy and Energy Efficiency Program (North-REP)
- Pacific Environment Community (PEC) Fund
- Pacific Alliance for Sustainability
- Pacific Islands Climate Change Action Program (PICCAP)

4.8.3 Fiscal Instruments and Incentives

Information on tax incentives and subsidies is not available.

4.8.4 Support, Information, and Voluntary Action Policies

Information on any activities related to training and demonstration projects on renewable energy is not available.

4.8.5 Monitoring, Verification, and Enforcement Activities

No monitoring, verification, and enforcement policies are active at present

4.8.6 Production and Manufacturing

There is no production of off-grid lighting system components in Papua New Guinea. All products are imported from Australia and other countries.

4.9 Republic of Marshall Islands[154]

Republic of Marshall Islands includes two groups of atolls and islands having a total land cover of 181 sq. km and a population of 61,022 individuals.
In 2009, 99.96 per cent of energy came from imported fossil fuels, such as diesel, petrol, kerosene and liquefied petroleum gas. Petroleum liquid fuel is mainly supplied to Republic of Marshall Islands by the Marshalls Energy Company, Mobil, and Pacific International, Inc. (PII), which entered the market in 2010. Marshalls Energy Company usually imports fuel from Korea and Singapore.

In the power sector, around 72 per cent of households in Republic of Marshall Islands are connected to the electricity grid Access to electrification which is around 99 per cent is centred mostly at Majuro and Ebeye islands. Access to grid electrification in the rural areas is around 32 per cent.

Contributions from renewable energy sources in 2009 were mainly from the solar photovoltaic (PV) units installed by the REP-5 programme (Support to the Energy Sector in Five ACP Pacific Island Countries Programme funded by the European Union).

4.9.1 Regulatory and Control Mechanisms[155]

The Energy and Planning Division of the Ministry of Resources and Development is the government body responsible for formulating energy framework and policies, and for their

154 http://www.spc.int/edd/en/document-download/finish/11-reports/801-rmi-country-energy-security-indicator-profile-2009
155 www.reegle.info/policy-and-regulatory-overviews/MH

coordination and implementation. The Economic Planning and Statistic Office is involved in rural electrification policies.

4.9.1.1 Energy Act

There was no specific Energy Act or legislation for Republic of Marshall Islands. However, a National Energy Policy and Strategic Action Plan was developed in 2008 and was endorsed by cabinet in 2009.

4.9.1.2 Marshall Island's National Energy policy

Marshall Islands National Energy Policy came into existence in 2003 but due to an energy crisis in 2008 it was again updated in 2009. Around $1 million were funded to adopt renewable technology in this updated version of National Energy Policy.

4.9.1.3 Energy Performance Standards

Energy performance standards for lamps and off-grid lighting systems are not defined.

4.9.2 Economic and Market-based Instruments[156]

4.9.2.1 Marshall Island's Renewable Energy Program

The Government of Marshall Island have carried out a considerable amount of work under its renewable energy program. Some of the relevant highlights from the program are as mentioned:

- Retrofitted lighting at Republic of Marshal Island's Energy Office through 30,000 Australian dollar funding by AUSAID;
- **Streetlight retrofits from mercury vapour to light emitting diode:** Around $1.1million funding provided by Italian government by way of the International Union for Conservation of Nature (IUCN);
- **Implementing solar streetlight project for Republic of Marshal Island's densely populated areas.** The Estimated value of the project was around $550,000 of which $400,000 was funded by Republic of China (Taiwan);
- **Solar photovoltaic grid-connected project for Majuro Hospital rooftop:** The Estimated value of the project was around $4.5 million and was funded by Japan's Cool Earth Partnership.
- **North Renewable Energy Project:** Around 1,500 standalone solar photovoltaic systems were distributed at an average cost of US$4,000–US$5,000 per system with support from the European fund.

4.9.2.2 Republic of the Marshall Islands – European Community EDF 10, Country Strategy Paper and National Indicative Programme (for the period 2008–13)[157]

Under the Tenth EU Development Program 2008–13, EUR 5.3 million has been allocated for development of the energy sector (via standalone solar systems to supply electricity to the outer islands) and to establish a technical cooperation facility.

156 www.reegle.info/policy-and-regulatory-overviews/MH
157 http://ec.europa.eu/development/icenter/repository/scanned_mh_csp10_en.pdf

4.9.2.3 Sustainable Energy for All in Small Island Developing States (SIDS-2012):

Through SIDS) country reiterates its National Energy Policy and Energy Action Plan, Change policy framework and Joint national action plan. Various activities planned are as given below

- A 40 per cent reduction in CO_2 emissions below 2009 levels by 2020.
- Electrification of 100 per cent of urban households and 95 per cent of rural outer atoll households by 2015.
- The provision of 20 per cent of energy through indigenous renewable resources by 2020.

Improved efficiency of energy use in 50 per cent of households and businesses, and 75 per cent of government buildings by 2020.

4.9.2.4 National and International initiatives/ programs on off-grid lighting

The various initiatives by government/ international organisations on off-grid lighting system in Republic of Marshall Islands are as mentioned below and the details of these initiatives are provided in earlier section ‘‘Initiatives on Off-Grid lighting in Pacific Countries’’

- North Pacific ACP (African, Caribbean and Pacific) Renewable Energy and Energy Efficiency Program (North-REP)
- Pacific Island Renewable Energy Project
- Pacific Islands Energy Policy and Strategic Planning (PIEPSAP)
- Pacific Environment Community (PEC) Fund
- Pacific Alliance for Sustainability
- The Project for Introduction of Clean Energy by Solar Electricity Generation System
- Green Micronesia Initiative
- Pacific Islands Climate Change Action Program (PICCAP)

4.9.3 Fiscal Instruments and Incentives

Information on tax incentives and subsidies is not available.

4.9.4 Support, Information, and Voluntary Action Policies

- Energy Efficiency Conference was organised with technical and financial assistance from Secretariat of the Pacific Community (SPC).
- Government aims at phasing out inefficient lighting fixtures. Marshalls Electric Company started installing 10,000 CFL’s and replacing inefficient incandescent lamps in Marshall Islands.

4.9.5 Monitoring, Verification, and Enforcement Activities

No monitoring, verification, and enforcement policies are active at present

4.9.6 Production and Manufacturing

There is no production of off-grid lighting system components in Republic of Marshall Islands. All products are imported from other countries.

4.10 Samoa[158]

Samoa consists of two large island groups and four small islands having a total land cover of 2,935 sq. km and population of 183,203.

In 2009, petroleum fuels accounted for 95.6 per cent of energy consumption and renewable energy from hydro and solar power accounted for 4.4 per cent.

Around 98 per cent of households in Samoa are connected to the electricity grid network provided by the Electric Power Corporation.

4.10.1 Regulatory and Control Mechanisms[159]

The Energy Unit of the Ministry of Finance's Economic Planning and Policy Division. is responsible for energy planning, policy coordination, and implementation coordination.

4.10.1.1 Energy Act

Samoa does not have an Energy Act in action at present. However, Samoa developed its National Energy Policy and Strategic Action Plan in 2006, which was endorsed by Cabinet in 2007 with four focal areas (planning/ management, renewable energies, electricity, and petroleum). The Electricity Act of 1980 and its amendments of 2001 and 2010 mandate the Electric Power Corporation to distribute electricity in Samoa and also issue permits for generation of electricity.

4.10.1.2 Samoa's National Energy Policy

The objective of Samoa's national energy policy is to remove its dependency from fossil fuels to renewable energy generation using solar energy, wind energy, etc., with a vision 'to enhance the quality of life for all through access to reliable, affordable and environmentally sound energy services and supply'. Key strategic outcomes of the policy are as listed below:

- Promote and increase renewable energy generation;
- Efficient, affordable and reliable electric supply; and
- Promote energy efficiency in all sectors.

4.10.1.3 Energy Performance Standards

Energy performance standards for lamps and off-grid lighting systems are not defined.

4.10.2 Economic and Market-Based Instruments[160]

4.10.2.1 National and International initiatives/ programs on off-grid lighting

- The various initiatives by government/ international organisations on off-grid lighting system in Samoa are as mentioned below and the details of these initiatives

158 http://www.spc.int/edd/en/document-download/finish/11-reports/796-samoa-country-profile
159 http://www.reegle.info/policy-and-regulatory-overviews/WS
160 www.reegle.info/policy-and-regulatory-overviews/WS

are provided in earlier section "Initiatives on Off-Grid lighting in Pacific Countries"
Biomass Resource Assessment

- Pacific Islands Renewable Energy Project (PIREP)
- North Pacific ACP (African, Caribbean and Pacific) Renewable Energy and Energy Efficiency Program (North-REP)
- Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP)
- Pacific Environment Community (PEC) Fund
- Pacific Alliance for Sustainability
- Promoting Energy Efficiency in the Pacific(PEEP)Pacific Islands Energy Policy and Strategic Planning (PIEPSAP)
- Biomass resource assessment
- Pacific Islands Climate Change Action Program (PICCAP)
- Promotion of Renewable Energy, Energy Efficiency and Greenhouse Gas Abatement (PREGA)

4.10.3 Fiscal Instruments and Incentives

Information on tax incentives and subsidies is not available.

4.10.4 Support, Information, and Voluntary Action Policies

Information on any activities related to training and demonstration projects on renewable energy is not available.

4.10.5 Monitoring, Verification, and Enforcement Activities

No specific monitoring, verification and evaluation framework is in place for the off-grid lighting system.

4.10.6 Production and Manufacturing

There is no production of off-grid lighting system components in Samoa. All products are imported from Australia and New Zealand.

4.11 Solomon Islands[161]

Solomon Islands includes two large islands and around 996 small islands with a total land cover of about 28,370 sq. km and a total population strength of about 525, 870.

In 2009, petroleum fuels accounted for 99.96 per cent of total energy consumption and renewable energy from hydro and solar accounted for 0.04 per cent . Petroleum fuel is currently supplied to Solomon Islands by the Markwarth Oil and the South Pacific Oil. Liquefied petroleum gas products are mostly imported from Australia.

In the power sector, around 14 per cent of households are connected to the electricity grid network provided by Solomon Islands Electricity Authority (SIEA).

161 http://www.spc.int/edd/en/document-download/finish/11-reports/837-solomonislandscountryenergysecurityindicatorprofile

4.11.1 Regulatory and Control Mechanisms162

There is no dedicated energy unit or body responsible for looking after energy sector in the country. Under the Ministry of Finance, regulation of state-owned enterprise is the responsibility of enterprise itself.

4.11.1.1 Energy Act

There is no Energy Act for Solomon Islands. However, in 2006, the National Energy Policy and Strategic Action Plan were developed, and in 2007 it was endorsed by cabinet. Comprehensive reviews of legislative framework were performed in 2006, including Electricity Act, Foreign Investment Act, Petroleum Act, Price Control Act, Consumer Protection Act, Land and Titles Act, River Waters Act, Provincial Government Act). The modernization of the legislation has been outlined but not been implemented.

4.11.1.2 Energy Performance Standards

Energy performance standards for lamps and off-grid lighting systems are not defined.

4.11.2 Economic and Market-Based Instruments[163]:

4.11.2.1 National and International initiatives/ programs on off-grid lighting

The various initiatives by government/ international organisations on off-grid lighting system in Solomon Islands are as mentioned below and the details of these initiatives are provided in earlier section ‘‘Initiatives on Off-Grid lighting in Pacific Countries’’

Pacific Islands Energy Policy and Strategic Planning (PIEPSAP):

- World Bank’s Sustainable Energy Finance Project
- Pacific Island Renewable Energy Project (PIREP)
- Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP)
- Pacific Environment Community (PEC) Fund
- Pacific Alliance for Sustainability
- Pacific Islands Climate Change Action Program (PICCAP)

4.11.3 Fiscal Instruments and Incentives

Information on tax incentives and subsidies is not available.

4.11.4 Support, Information and Voluntary Action Policies

Information on any activities related to training and demonstration projects on renewable energy is not available.

4.11.5 Monitoring, Verification, and Enforcement Activities

No monitoring, verification, and enforcement activities are in practice.

162 www.reegle.info/policy-and-regulatory-overviews/SB
163 www.reegle.info/policy-and-regulatory-overviews/SB

4.11.6 Production and Manufacturing

There is no production of off-grid lighting system components in Solomon Islands. All products are imported from Australia and New Zealand

4.12 Tonga[164]

Tonga includes 176 islands, of which 36 are inhabited, with a total land cover of 748 sq. km and a population of 103,977.

In 2009, petroleum fuels accounted for 99.97 per cent of total energy consumption and renewable energy from small, stand-alone solar units accounted for 0.03 per cent . Petroleum fuel products are currently supplied to Tonga by Pacific Energy and Total through Fiji from Singapore and Australia.

In the power sector, around 89 per cent of households in Tonga are connected to the electricity grid network provided by Tonga Power Limited.

4.12.1 Regulatory and Control Mechanisms[165]

The key body responsible for planning energy policies and strategies in Tonga is the Energy Planning Unit of the Ministry of Land, Survey, and Natural Resources. Overall responsibility for grid-connected electricity is under the Ministry of Finance and National Planning. The Energy Planning Office under the Ministry of Finance and National Planning is responsible for electrifying off-grid areas.

Off-grid electrification is done mostly through solar systems. Agreement with the Renewable Energy and Energy Efficiency Partnership (REEEP), aims to strengthen the regulatory capacity of the Unit, to further implementation of the Renewable Energy Bill, and to draft an Energy Efficiency Policy. Coordination of the Tonga Energy Road Map is currently through a team attached to the Prime Minister's office.

4.12.1.1 Energy Act

There is no separate Energy Act for Tonga. In 2002, a draft energy policy document was developed but was not implemented. In 2008, a Renewable Energy Bill was developed by the Energy Planning Unit and endorsed by parliament in 2009. The bill covers only off-grid renewable energy applications such as solar home systems deployed in the outer islands. In 2009, the Tonga Energy Road Map was drafted and endorsed in 2010. The Electricity Act, 2007 provides the governance framework for the electricity sector in Tonga and outlines the role of the Electricity Commission in regulating generation.

4.12.1.2 Energy Performance Standards

Energy performance standards for lamps and off-grid lighting systems are not defined.

164 http://www.spc.int/edd/en/document-download/finish/11-reports/802-tonga-country-energy-security-indicator-profile-2009
165 www.reegle.info/policy-and-regulatory-overviews/TO

4.12.2 Economic and Market-based Instruments[166]

4.12.2.1 Japan International Cooperation Agency and Tonga Government combined Initiative

The Japan International Cooperation Agency and Tonga Government are working closely to electrify the outer islands of Tonga by installing solar home systems on thirteen outer islands, with a population of about 1,400 people.

4.12.2.2 Combined Initiative of Tonga Power, Meridian energy, and New Zealand Aid Programme

Tonga Power, Meridian energy, and the New Zealand Aid Programme are working together on a solar photovoltaic project of capacity 1MW which would be directly fed into the grid.

4.12.2.3 Outer Islands Renewable Energy Project

The proposed Tonga Outer Islands Renewable Energy Project aims at building grid-connected solar photovoltaic supply. Its main objective is to supply sustainable, affordable, and reliable electricity to outer islands which are not grid connected.

4.12.2.4 National and International initiatives/ programs on off-grid lighting

The various initiatives by government/ international organisations on off-grid lighting system in Tonga are as mentioned below and the details of these initiatives are provided in earlier section ‘‘Initiatives on Off-Grid lighting in Pacific Countries’’

- Promoting Energy Efficiency in Pacific(PEEP)
- Pacific Environment Community (PEC) Fund
- Pacific Island Renewable Energy Project
- Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP)
- Pacific Islands Energy Policy and Strategic Planning (PIEPSAP)
- Pacific Alliance for Sustainability
- The Project for Introduction of Clean Energy by Solar Electricity Generation System
- Biomass resource assessment
- Pacific Islands Climate Change Action Program (PICCAP)

4.12.3 Fiscal Instruments and Incentives

Information on tax incentives and subsidies is not available.

4.12.4 Support, Information and Voluntary Action Policies

Information on any activities related to training and demonstration projects on renewable energy is not available.

166 www.reegle.info/policy-and-regulatory-overviews/TO

4.12.5 Monitoring, Verification and Enforcement Activities

No monitoring, verification, and enforcement policies are active at present.

4.12.6 Production and Manufacturing

There is no production of off-grid lighting system components in Tonga. All products are imported from Australia and New Zealand

4.13 Tuvalu[167]

Geographically Tuvalu consists of four spherical-shaped reef and four coral islands with a total land cover of about 26 sq. km and population of about 11,093.

In 2009, petroleum fuels accounted for 99.97 per cent of total energy consumption and renewable energy from solar generation accounted for 0.03 per cent . Petroleum fuel is currently supplied to Tuvalu by Pacific Energy, which imports through Fiji. Liquefied petroleum gas products are mostly imported from Australia.

Around 94 per cent of households in Tuvalu are connected to the electricity grid network provided by the Tuvalu Electricity Corporation. photovoltaic

4.13.1 Regulatory and Control Mechanisms[168]

The Department of Energy within the Ministry of Work and Energy is the government body responsible for planning and commissioning energy projects and strategies in the country. The details of energy act and national energy policy is explained below

4.13.1.1 Energy Act

Tuvalu does not have an Energy Act. However, a comprehensive National Energy Policy Framework was established by the Ministry of Works and Energy (approved by Cabinet in 2006 for 15 years). Strategies aim to ensure an 'adequate, secure, and cost-effective supply', 'efficient utilization of energy' and 'minimization of negative impacts of energy production, conversion, utilization, and consumption on the environment.' Rudimentary energy administration is handled by one professional. Tuvalu Electricity Corporation is an incorporated entity under the Tuvalu Electricity Corporation Act. Under the Act, it has the 'sole and exclusive right to supply electricity for sale within any supply area'. Where Tuvalu Electricity Corporation is unable to provide a reasonable supply of electricity (Section 6.2 of the Act) arrangements may be made for a license to be issued to a third party for supply of required electricity. Fuel prices are not fully regulated.

Tuvalu National Energy Policy

This policy came into existence in 2009 and focuses on the following key areas:

- Energy sector planning, coordination, and management
- Petroleum
- Transport
- Electricity, Renewable Energy

167 http://www.spc.int/edd/en/document-download/finish/11-reports/799-tuvalu-country-energy-security-indicator-profile-2009
168 www.reegle.info/policy-and-regulatory-overviews/TV

- Energy Conservation and Environment
- Energy Efficiency

4.13.1.2 Energy Performance Standards

Energy performance standards for lamps and off-grid lighting systems have not been defined.

4.13.2 Economic and Market-based Instruments[169]

Tuvalu is part of the GEF Pacific Alliance for Sustainability (GEF-PAS) programme under the "Low Carbon Energy Islands: Accelerating the Use of Renewable Energy and Energy Efficiency Technologies" initiative. Tuvalu's National Adaptation Programme of Action (NAPA), released in 2007, provides detailed information about the current and possible future impacts of climate change on this island nation.

4.13.2.1 4.13.2.2 Tuvalu's Sustainable Energy Interventions Initiative

This initiative focus on creating awareness amongst the population about energy efficiency and conservation develops capacity of technicians to maintain solar diesel hybrid system and standalone photovoltaic systems.

4.13.2.3 National and International initiatives/ programs on off-grid lighting

The various initiatives by government/ international organisations on off-grid lighting system in Tuvalu are as mentioned below and the details of these initiatives are provided in earlier section "Initiatives on Off-Grid lighting in Pacific Countries"

- 4.13.2.3 Pacific Islands Greenhouse Gas Abatement through Renewable Energy Programme (PIGGAREP
- Pacific Islands Energy Policy and Strategic Planning (PIEPSAP)
- Pacific Environment Community (PEC) Fund
- Pacific Alliance for Sustainability
- Biomass resource assessment
- Pacific Islands Climate Change Action Program (PICCAP)

4.13.3 Fiscal Instruments and Incentives

Information on tax incentives and subsidies is not available.

4.13.4 Support, Information, and Voluntary Action Policies

Information on any activities related to training and demonstration projects on renewable energy is not available.

4.13.5 Monitoring, Verification, and Enforcement Activities

No monitoring, verification, and enforcement policies are active at present.

169 www.reegle.info/policy-and-regulatory-overviews/TV

4.13.6 Production and Manufacturing

There is no production of off-grid lighting system components in Tuvalu. All products are imported from Australia and New Zealand

4.14 Vanuatu[170]

Vanuatu consists of a scattered group of about 80 islands out of which 65 are inhabited. The total land cover is 12,190 sq. km with a population of 234,023.

In 2009, petroleum fuels accounted for 99.97 per cent of total energy consumption and renewable energy from hydro, wind and coconut oil biofuel accounted for 0.03 per cent. Petroleum fuel products (excluding liquefied petroleum gas) are supplied to Vanuatu by Pacific Petroleum, which mainly imports fuel to Vanuatu from Singapore via Solomon Islands. Liquefied petroleum gas products are imported by Origin Energy from Australia.

In the power sector, around 28 per cent of households in Vanuatu are connected to the electricity grid network. Electricity is supplied by Union Electrique de Vanuatu Limited. Of the electricity generated in 2009, around 8.9 GWh was contributed from renewable energy sources (hydro, wind and coconut oil biofuel).

Access of households to grid electrification in urban areas (Port Vila and Luganville) stands at 80 per cent and at 11 per cent in rural areas. Over 75 per cent of households in Vanuatu are reported to be living in rural and remote areas.

4.14.1 Regulatory and Control Mechanisms[171]

The Energy Unit within the Ministry of Lands, Geology, Mines, Energy, Environment, and Water Resources is the government body responsible for planning energy strategies and commissioning them. Energy Unit work is focused on the implementation of donor funded rural electrification projects.

4.14.1.1 Energy Performance Standards

Energy performance standards for lamps and off-grid lighting systems have not been defined.

4.14.2 Economic and Market-Based Instruments[172]

4.14.2.1 Vanuatu's Energy Roadmap

Vanuatu's government with the help from World Bank has initiated the development of Vanuatu's Energy Roadmap which would lay the foundation of future energy demand of the country and will identify the sectors that could help in bridging the demand supply gap in terms of energy.

4.14.2.3 Vanuatu's Energy for Rural Development Programme

Vanuatu's Energy for Rural Development Programme aims at identifying potential for rural electrification and aims to electrify 80 per cent of all the rural areas by 2025.

170 http://www.spc.int/edd/en/document-download/finish/11-reports/795-vanuatu-country-profile
171 www.reegle.info/policy-and-regulatory-overviews/VU
172 www.reegle.info/policy-and-regulatory-overviews/VU

4.14.2.4 National and International initiatives/ programs on off-grid lighting

The various initiatives by government/ international organisations on off-grid lighting system in Vanuatu are as mentioned below and the details of these initiatives are provided in earlier section ‘‘Initiatives on Off-Grid lighting in Pacific Countries’’

- World Bank Sustainable Energy Financing Initiative
- Pacific Island Green House Gas Abatement through Renewable Energy Project (PIGGAREP)
- Pacific Island Renewable Energy Project (PIREP)
- Pacific Islands Energy Policy and Strategic Planning (PIEPSAP)
- Pacific Environment Community (PEC) Fund
- Pacific Alliance for Sustainability
- Pacific Region Infrastructure Facility (PRIF)
- Biomass resource assessment
- Pacific Islands Climate Change Action Program (PICCAP)

4.14.3 Fiscal Instruments and Incentives

Information on tax incentives and subsidies is not available.

4.14.4 Support, Information and Voluntary Action Policies

Information on any activities related to training and demonstration projects on renewable energy is not available

4.14.5 Monitoring, Verification and Enforcement Activities

No specific monitoring and evaluation framework is in place for Vanuatu. Selected monitoring and evaluation activities are carried out on funded projects only.

4.14.6 Production and Manufacturing

There is no production of off-grid lighting system components in Vanuatu. All products are imported from Australia and New Zealand

5.0 Recommendations for the Southeast Asian and Pacific Regions

With approximately 118 million people living without any access to grid electricity in Southeast Asia and Pacific, there is a strong need to enlighten the lives of these people with alternative means, off-grid lighting being the main point in focus. To increase the use of efficient off-grid lighting system, the following recommendations have been drafted based on the information available in various published reports, articles and interactions with country representatives.

Development of Standards and Codes

In all the six Southeast Asian countries and the Pacific countries, standards and codes for light emitting diodes, solar photovoltaic modules and batteries are not available. There is a strong need to develop the standards and codes in Southeast Asian region. These standards and codes can be developed by taking reference from the developed International codes by International Electro-technical Commission (IEC) and from the codes followed by various countries.

Labelling Schemes

In some of the Southeast Asian, voluntary labelling for compact fluorescent lamps are already in place. However labelling for light emitting diodes, solar photovoltaic systems and batteries are yet to be established. In order to ensure the energy performance of the off-grid lighting system, it is recommended that programs for establishing a labelling scheme for different off-grid lighting components should be started.

Fiscal Instruments

The initial cost of off-grid lighting systems is high which hampers its adoption by the population at large scale. In order to increase the use of off-grid lighting systems, financial incentives such as value added tax reduction, import duty reduction and various other sustainable fiscal incentives need to be initiated by different countries of Southeast Asian and Pacific region.

Increase Public Awareness about Quality and Costs

Awareness on the availability and benefits (health and monetary) of efficient off-grid lighting systems through media campaigns, voluntary actions and pilot projects should be taken by the Government of various Southeast Asian and Pacific countries.

Laboratory Testing

Many countries in the region either have limited laboratory facilities or lack facilities capable of carrying out testing procedures as per international procedures. The agreement should be made between the countries for testing of products in countries where testing laboratories are available.

Accreditation of Testing Laboratories

In order to increase the credibility of test results generated by various laboratories, the laboratories should be recognised by government body responsible for accreditation.

Enforcement of Quality Products

In order to ensure that tested products shall only be distributed, setting up of an enforcement body is required in different countries of Southeast Asian and Pacific region.

Capacity Building

Training programs for various professionals working in testing laboratories and enforcement organisations need to be conducted at regular intervals.

Annexure I-Off-grid lighting initiatives in Southeast Asian countries

Name of the country	Name of the program/initiative/project	Funding organization/Source	Implementing Body	Main objectives	Start date	End date
Cambodia	Rural Electrification Fund	World Bank and Global Environment Facility (GEF)	Royal Government of Cambodia	To provide electricity (of some form) to all rural households by 2020. The programme includes bulk purchase of 12, 000 solar housing systems (each having a capacity of 40 Watt peak (Wp))	2004	
	Moon light rental scheme	Kamworks (Solar Company in Cambodia)	Kamworks (Solar Company in Cambodia)	Renting out of solar lanterns by village entrepreneurs at a rate equal to rate kerosene. For scaling up the program, Kamworks is supported by ADB's energy for all programs.	2008	
	Solar Campus	Kamworks and Picosol	Kamworks and Picosol	To provide training on solar energy		
	Solar Guarantee Fund	Kamworks and Picosol	Kamworks and Pico Sol	To develop a solar guarantee fund for solar lantern entrepreneurs thereby facilitating access to finance for them.		
	Microfinance for battery charging stations, solar SMEs	Amret Microfinance and ACLEDA Bank	Royal Government of Cambodia	To provide finance for setting up battery charging stations		
Indonesia	Rural electrification program	Indonesia Government	Indonesia Government	To provide free of cost SHS to households	1997	
	TERI Solar Multi Utility (SMU) program	PT Azet (Private company dealing with renewables)	TERI and PT Azet	The program is based on Lighting a billion lives (LaBL)	2009	
Lao PDR	Rural Electrification Adaptable Program Lending (APL) Program	Phase 1- World Bank and Australia bilateral assistance (AusAID)	Government of Lao PDR and electricity distributing	To increase the access to electricity of rural households in villages and improve financial performance of the		

Name of the country	Name of the program/initiative/project	Funding organization/Source	Implementing Body	Main objectives	Start date	End date
			companies	power sector. Establishment of Renewable energy fund for generation of electricity through renewables		
	Rural Electrification Adaptable Lending Program	Phase 2- GEF	Government of Lao PDR and electricity distributing companies	To increase the access to electricity of rural households in villages and improve financial performance of the power sector. Establishment of Renewable energy fund for generation of electricity through renewables		
	Renewable Energy Development in Remote Communities	ADB and Japan fund for poverty reduction	Government of Lao PDR	To assist the Government of Lao PDR in pursuing its ambitious target of electrifying 80% of villages and 90% of households by 2020	2011	
Philippines	Rural Power Project	World Bank	Philippine Government	Major components of the project include rural electrification, capacity building and credit risk guarantee	2003	

Name of the country	Name of the program/initiative/project	Funding organization/Source	Implementing Body	Main objectives	Start date	End date
	Alliance for Mindanao Off-grid Renewable Energy (AMORE) Program	Partnership between USAID, DoE Philippines and private sector industries (Sun power etc.)	Winrock international and Philippines government	The major objective of the program is to bring energy services to remote, conflict affected communities in rural Mindanao, the second largest island of Philippines	2002	
	Rural Electrification Services Project	French Filipino Loan Protocol financing	Filipino company Pamtec (PRES),	To improve the living conditions of the residents in Masbate by providing them adequate and reliable energy services		
	Solar Power Technology Supports Project	Department of Agrarian Reform, Philippines	Department of Agrarian Reform, Philippines	To address poverty in the off-grid agrarian reform communities through the introduction of solar PV applications	2005	2007
	Solar Home System Distribution Project	Dutch Government	Philippine National Oil Company	To install SHS system	2002	2007
	Liter of Light	My shelter foundation	My shelter foundation	To use plastic bottles to light up homes not connected to grid electricity	2011	2015
Thailand	National Plan for Thailand Accelerated Rural Electrification	Government of Thailand	Provincial Electricity Authority		1973	1996

Name of the country	Name of the program/initiative/project	Funding organization/Source	Implementing Body	Main objectives	Start date	End date
	Small Power Producer Programme and Very Small Power Producer Programme	Government of Thailand	Energy Generating Authority of Thailand	To purchase power from power plants that generate power through combined heat and power plant or through renewable sources, under transparent and predictable power purchase agreements	1992	
	Sun Sawang initiative	Sun Sawang	Sun Sawang	To implement and repair solar systems bought in 2004 by Thai government for the remote areas		
Viet Nam	Rural electrification	Government of Viet Nam	National electricity company	To develop national power grid to supply electricity to 100% households	2011	2020
	Energy Sector Management Assistance Program	UNDP and World Bank	Government of Viet Nam	To provide reliable electricity to rural people	2001	
	Solar Energy Project	Finnish Government	Government of Vietnam	To help Viet Nam on applying solar energy in 17 mountainous communes and localities inhabited by ethnic minority people in Ky Son, Que Phong and Quy Chau districts in the central province of Nghe		

Name of the country	Name of the program/initiative/project	Funding organization/Source	Implementing Body	Main objectives	Start date	End date
	Viet Nam Sweden Rural Energy Program	Swedish international Development Agency and the Ministry of Industry and Trade	Government of Viet Nam	To enhance the pace of off-grid electrification in rural Areas mainly through solar PV and bio-gas	2004	2009
	Renewable Energy Development and Network Expansion and Rehabilitation	ADB	Government of Viet Nam	To deploy hydropower in rural areas	2009	
	Clean Energy in Rural Viet Nam	World Vision Australia and Renewable Energy and Energy Efficiency Partnership (REEEP)	Government of Viet Nam	To provide 100MWh supply from renewable energy per year to two or more villages and at generating awareness	2013	2014

Annexure 2-Off-grid lighting initiatives in the Pacific Countries

Common Initiatives in the Pacific Countries

Name of the Initiative	Countries where the initiative is active/implemented	Funding Organization	Implementing body	Main objective	Start date	End date
Promoting Energy Efficiency in Pacific (PEEP)	The Cook Islands, Papua New Guinea, Tonga, Samoa and Vanuatu	Global Environment Facility and	Asian Development Bank and Pacific Alliance for Sustainability	To help in reducing the fossil fuel consumption through demand side energy activities	2011	2014
Pacific Islands Renewable Energy Project (PIREP)	Vanuatu, Tuvalu, Tonga, Solomon Islands, Samoa, Papua New Guinea, Palau, Niue, Nauru, Marshall Islands, Kiribati, Fiji, Federated States of Micronesia, Cook Islands	United Nations Development Programme	South Pacific Regional Environment Programme	To facilitate the widespread implementation and commercialization of renewable energy technologies in the various Pacific nations		
Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP)	Tuvalu, Tonga, The Cook Islands, Solomon Islands, Samoa, Papua New Guinea, Niue, Nauru, Kiribati and Fiji	United Nation Development Programme and Global Environment Facility	Secretariat of Pacific Community	To help in reducing the greenhouse gas emissions generated from the fossil fuels used in Pacific through widespread and cost effective use of renewable energy resources		2006
North Pacific ACP (African, Caribbean and Pacific) Renewable Energy and Energy Efficiency Program (North-REP)	the Federated States of Micronesia, Palau and Republic of Marshall Islands	European Development Fund (EDF)	Secretariat of Pacific Community	To help develop the energy sectors		

Pacific Islands Energy Policy and Strategic Planning (PIEPSAP)	Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Republic of Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu	European Energy Initiative and United Nations Development Programme	Pacific Islands Energy Policy and Strategic Planning	• Development of national energy policies. • Development of national strategic plans to implement policies • Awareness on energy efficiency		
Pacific Environment Community (PEC) Fund	Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Niue, Nauru, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu	The Government of Japan	Secretariat of Pacific Community	To support projects which focus on solar power generation and sea water desalination plant		
Pacific Alliance for Sustainability	Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Niue, Nauru, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu	Global Environment fund	Pacific Alliance for Sustainability	To increase the efficiency and effectiveness of GEF support to Pacific Island Countries, thereby enhancing achievement of both global environmental and national sustainable development goals	1941	
The Project for Introduction of Clean Energy by Solar Electricity Generation System	Tonga, Kiribati, Federated States of Micronesia, Palau, and Republic of Marshall Islands.	Japan International Cooperation Agency	Secretariat of the Pacific Community	Technical and Financial assistance was provided in the implementation of renewable energy generation projects		
Green Micronesia Initiative			Chief Executives of the Micronesian governments.	To increase energy efficiency and energy conservation by 20 per cent and expand usage of renewable energy	2010	
World Bank's Sustainable Energy Finance Project	Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Niue, Nauru, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu			To Improve and expand the usage of renewable energy in the country by providing incentives and subsidies on the use of renewable energy		

Pacific Region Infrastructure Facility	Tuvalu, Solomon Island and Vanuatu	World Bank		To provide support for increased and equitable access to reliable and affordable energy.		
Promoting access to renewable Energy in Pacific	Papua New Guinea, Solomon Islands, and Vanuatu	Asian Development Bank	The Pacific Approach Framework	To improve energy efficiency and enhance the usage of renewable energy.		
Biomass resource assessment	Fiji, Kiribati, Samoa, Tonga, Tuvalu & Vanuatu			To prepare a training manual and associated training materials for biomass resource assessment		
Pacific Islands Climate Change Action Program	Samoa, Cook Islands, Fiji Islands, French Polynesia, Guam, Kiribati, Commonwealth of the Northern Marianas, Marshall Islands, Federated States of Micronesia, Nauru, New Caledonia, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, Wallis and Futuna.		Pacific Islands Framework for Action on Climate Change	This Framework is intended to inform the decisions and actions of national, regional and international partners, and seeks to mainstream climate change into regional and national policies and plans across specific sectors, including: disaster risk management, water, waste management, agriculture, energy, forestry and land use, health, coastal zone management, marine ecosystems, ocean management, tourism, and transport.		
Promotion of Renewable Energy and Energy Efficiency		Dutch Cooperation Fund		to promote investments in renewable energy, energy efficiency and greenhouse gas abatement technologies in developing member countries	2002	

Country specific initiatives in the Pacific Countries

Name of the country	Name of the program/initiative/project	Funding organization/Source	Implementing Body	Main objectives	Start date	End date
Cook Island	Electrification of Pukapuka	French Government		Electrification of Pukapuka through standalone solar PV	1992	
	Renewable Energy Chart	Not applicable	Government of Cook Island	Defines country roadmap for achieving 100% electrification by 2020	2012	
Federated states of Micronesia (FSM)	Pohnpei Power Sector Development Project	Not defined	Not defined	To support the development of power system of Phonepi State and to reduce its energy dependency on fossil fuels by expanding and enhancing the generation through renewable means		
Fiji	Fiji: Promoting Sustainability of Renewable Energy Technologies and Renewable Energy Service Companies	Global Environmental Facility	Not defined	To remove barriers to the implementation of renewable energy for rural electrification		
	Namara, Toyotal Island and Vatulele Solar project	USAID and Fiji Government	Department of Energy	The project was to install 100 solar home systems. The sites selected for installation were Namara, Toyota Island and Vatulele and each of the sites were provided with 30-40 SHS. In year 1985, SHS for 20 households were installed at Namara through a funding of Fiji $30000 by Kadavu local government. In year 1994, SHS for 63	1983	

				households were installed at Namara.		
	Solar Home System for Provinces of Bua, Cakaudrove, and Macuata		Department of Energy	Based on the survey of Department of Energy procurement of solar home system was done	2003	2005
	Naroi Photovoltaic Project	French Government	Department of Energy	Electrification of the village of Naroi on the island of Moala using solar photovoltaic modules. Approximately 170 households were equipped with pre-payment metered, solar powered lighting systems. No power points were included for radio or other appliance operation	1998	1999
	Vanua Levu solar project	Government of Japan	Pacific International Center for High Technology Research (PICHTR) and DoE	Implementation of SHS on 60 households for Vunivau by the year 2002. In second phase around 96 households (44 households near Nasua, 12 near Onelake and 40 near Vusasivo) were covered.		2002
	Future Plans for Solar Home Systems		Department of Energy	Approximately 20,000 households could be served with solar home systems		
	Fiji Renewable Energy Power Project (FREPP)	GEF Pacific Alliance for Sustainability Programme	Not defined	To remove barriers to the widespread and cost effective use of grid based renewable energy supply		
	Sustainable Energy Financing Project (SEEP)	World Bank	Government of Fiji	To make renewable energy and energy efficient equipment more affordable for the people		

Kiribati	Rural solar electrification programme	Kiribati Solar Energy Company (KSEC)	Kiribati Solar Energy Company	Distribution of around 2300 units of solar home systems		
	Other projects	Not defined	Not defined	Solar home systems for lighting, Photo voltaic hybrid mini grid for Chevalier College, Abemama, Solar photo voltaic pump systems for outer islands secondary schools and solar desalination for water battery needs at KSEC office		
Nauru	Energy Efficiency Action Plan (EEAP)	Not defined	Not defined	To improve energy efficiency	2008	2015
Niue	Niue's Renewable Energy and Energy Efficiency Programme		Nauru Ministry of Finance	to contribute to poverty alleviation by improving the access to electricity and thus enhance the living conditions in Nauru		
Palau	Project for Introduction of Clean Energy by Solar Electricity Generation Systems	Government of Japan	Government of Palau	To generate electricity by using PV modules.	2009	
Papua New Guinea (PNG)	Papua New Guinea Sustainable Development Program Limited (PNGSDP)	Papua New Guinea Sustainable Development Program Limited (PNGSDP)	Papua New Guinea Sustainable Energy Limited (PNGSEL)	To promote sustainable development of Papua New Guinea through affordable and sustainable infrastructure, capacity building, health and education		

Republic of Marshall Island	Marshall Islands' Renewable Energy Program	Not defined	Government of Republic of Marshal Island	Retrofitted lighting at Republic of Marshal Island's Energy Office, Streetlight retrofits from mercury vapour to Light Emitting Diode (LED), implementing solar streetlight project for Republic of Marshal Island's densely populated areas, solar PV grid-connected project for Majuro Hospital rooftop,		
	10th EU Development Program	Not defined	Not defined	To increase the use of renewable energy and energy efficient products.	2008	2013
	Sustainable Energy for All in Small Island Developing States (SIDS)			Electrification of 100% of urban households and 95% of rural outer atoll households by 2015, Provision of 20% of energy through indigenous renewable resources by 2020 and Improved efficiency of energy use in 50% of households and businesses, and 75% of government buildings by 2020		
Solomon Island	Sustainable Energy Finance project	World Bank		To improve and expand the usage of renewable energy in country		
Tonga	Japan International Cooperation Agency and Tonga Government combined Initiative	Japan International Cooperation Agency and Tonga Government		To electrify outer island of Tonga by installing solar home system on thirteen outer islands, with a population of about 1,400 people		

	Combined Initiative of Tonga Power, Meridian energy, and New Zealand Aid Programme	Tonga Power, Meridian energy, and the New Zealand Aid	Tonga Power, Meridian energy, and the New Zealand Aid	To install a solar photovoltaic project of capacity 1MW which would be directly fed into the grid		
	Outer Island renewable energy project			To supply sustainable, affordable and reliable electricity to outer islands which are not grid connected.		
Tuvalu	Tuvalu's Sustainable Energy initiatives			This initiative aims to create awareness amongst the population about energy efficiency and conservation		
Vanuatu	Vanuatu's Energy Roadmap	World Bank	Vanuatu's government	Vanuatu's government aims to develop Vanuatu's Energy Roadmap which would lay the foundation of future energy demand of the country.		
	Energy for Rural Development Programme			This programme aims to identify potential for rural electrification and to electrify 80% of all the rural areas by 2025.		