IRENA
International Renewable Energy Agency

# ACCELERATING RENEWABLE MINI-GRID DEPLOYMENT:

# A STUDY ON THE PHILIPPINES

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## About IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future, and serves as the principal platform for international co-operation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy, in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity.

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This report benefited from the reviews and comments of experts including Michael Vemuri, Ernesto Terrado and Ferdinand Larona (GIZ), as well as IRENA colleagues.

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## Disclaimer

# FOREWORD

## from the Secretary of Energy

Modern energy is the foundation of economic and social development. Thus, providing affordable basic services to those households without access to electricity has always been the top priority under the Total Electrification Program of the Philippines' Department of Energy (PDOE).

In a country of more than 7,600 islands, the provision of adequate, reliable, clean and modern energy has long been a challenge, particularly in remote and isolated areas. With the dramatic decline in costs, renewable energy technologies have become a feasible and cost-effective option, not only to meet the basic need for electricity, but more profoundly, as a sustainable solution to support productive uses through mini-grid systems.

Over the past decades, the Philippines made remarkable progress in utilising renewable energy sources and has developing a wealth of knowledge on geothermal, hydropower, biomass, solar photovoltaic and wind power applications in a range of conditions.

With new technological development and innovations happening worldwide, as well as new policies and regulatory reforms being put in place domestically, the PDOE is optimistic that the country can meet the goal of total electrification by 2022.

This study, conducted by the International Renewable Energy Agency (IRENA), has provided useful insights and analysis to help overcome the barriers that the Philippines faces in scaling up decentralised power systems, particularly through mini-grids powered in full or in part by renewable energy sources. As emphasized in the key recommendations, this can only happen through collective efforts of government and instrumentalities and the private sector. Accordingly, all stakeholders are encouraged to participate actively in the whole sustainable development chain – from energy planning and policy and regulatory formulation through to project development and execution.

To this end, the PDOE wishes to expresses its sincere appreciation for the excellent work IRENA has contributed in this important endeavour.

The PDOE looks forward to even stronger co-operation with IRENA to promote affordable, reliable and sustainable energy development, with the aim to build an energy-independent and climate-resilient future for the Philippines.

**Alfonso G. Cusi**
**Secretary of Energy**
**The Philippines**

# FOREWORD

## from the IRENA Director-General

The Philippines and other member states of the Association of South-East Asian Nations (ASEAN) are relying increasingly on indigenous renewable energy to meet growing energy demand, as well as to reduce energy imports and enhance energy security and access. The deployment of renewables has witnessed a considerable acceleration in recent years, reflecting favourable policy frameworks and increased private sector investments.

At the same time, the geography of the Philippines, consisting of thousands of islands and remote island communities, raises unique challenges in terms of energy access and rural electrification. Extension of power grid infrastructure to these locations is often not viable. But this makes mini-grids based on renewable energy technologies an ideal solution. Off-grid renewable costs have fallen dramatically, while the technologies have continued improving. Renewable mini-grids now have a proven track record of delivering cost-competitive electricity services in rural areas.

The Renewables Readiness Assessment (RRA) on the Philippines, carried out in co-operation with the International Renewable Energy Agency (IRENA) and released earlier this year, highlighted the need for an in-depth study of renewable electrification potential based on mini-grids.

Moving rapidly to implement this recommendation, IRENA worked closely with the Philippine Department of Energy (PDOE) to undertake the present study, which examines barriers to implementation. Ultimately, the study identifies five main recommendations to accelerate renewable mini-grid development:

- Clarify the roles and responsibilities of different agencies on rural electrification, while strengthening the participation of the private sector and civil society;
- Undertake comprehensive and strategic planning for off-grid electrification;
- Establish a clear policy approach for mini-grids that provides appropriate incentives where needed;
- Revise regulatory approaches for mini-grid projects, including streamlining regulations for small projects (below 200 kilowatts); and
- Increase support for project finance, development and execution.

I am confident that these recommendations provide a clear pathway forward and that the engagement of national stakeholders, along with support among regional and international partners, will continue to grow as the Philippines sets out to scale-up renewable energy solutions though concrete actions and measures such as the development of renewable energy mini-grids.

I wish to express my appreciation to the PDOE for its active support and participation in undertaking this study and for the fruitful partnership that has developed during this process.

IRENA looks forward, in the years ahead, to strengthened collaboration with the Philippines and other ASEAN members. Together, we can make South-East Asia's transition to a sustainable energy future a reality.

**Adnan Z. Amin**
**Director-General**
**International Renewable Energy Agency**

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# Abbreviations

| | |
|---|---|
| ADB | Asian Development Bank |
| AMORE | Alliance for Mindanao and Multi-Regional Renewable Energy Development |
| AREC | Affiliated Renewable Energy Centre |
| CAPEX | Capital expenditure |
| CEP | Community Energiser Platform |
| DOE | Department of Energy |
| DU | Distribution utility |
| EPIMB | Electric Power Industry and Management Bureau |
| EPPB | Energy Policy and Planning Bureau |
| ERC | Energy Regulatory Commission |
| EU | European Union |
| FIT | Feed-in tariff |
| GIS | Geographic information system |
| GIZ | Deutsche Gesellschaft Für Internationale Zusammenarbeit |
| IEA | International Energy Agency |
| IED | Innovative Energie Developpment |
| IPPs | Independent power producers |
| IRENA | International Renewable Energy Agency |
| IRR | Implementing Rules and Regulations |
| kVA | Kilovolt ampre |
| kW | Kilowatt |
| kWh | Kilowatt hour |
| LCOE | Levelised cost of energy |
| MW | Megawatt |
| MWh | Megawatt hour |
| NCIP | National Commission on Indigenous Peoples |
| NEA | National Electrification Administration |
| NEDA | National Economic and Development Authority |
| NGCP | National Grid Corporation of the Philippines |
| NGO | Non-Governmental Organisation |
| NPC | National Power Corporation |
| NREB | National Renewable Energy Board |
| NREL | National Renewable Energy Laboratory |
| NWRB | National Water Resources Board |
| OPEX | Operating expenses |
| ORED | Office of Renewable Energy Development |
| PHILRECA | Philippine Rural Electric Cooperatives Association |
| PPA | Power purchase agreement |
| PRES | Philippine Rural Electrification Service |
| PV | Photovoltaic |
| QTP | Qualified third party |
| REMB | Renewable Energy Management Bureau |
| RET | Renewable energy technology |
| SAMELCO | Samar Electric Cooperative |
| SNA | Senator Ninoy Aquino |
| SPUG | Small Power Utilities Group |
| Sq. km | square kilometres |
| SUKELCO | Sultan Kudarat Electric Cooperative |
| UNEP | United Nations Environment Programme |
| USAID | United States Agency for International Development |
| VAT | Value-added tax |

# Executive summary

According to the Philippines Department of Energy (DOE), the level of electrification in the Philippines was 80.9% as of 2014, leaving 4.2 million households without electricity. In its Household Electrification Development Plan, the government had set a target of 90% household electrification by the end of 2017 with the goal of ensuring "that every Filipino family shall have an equal opportunity to access basic electricity services". Electrifying these households remains a significant challenge for the energy sector. Due to its archipelagic geography, the Philippines comprises many remote and small island communities, and it is these smallest and most remote that remain un-electrified. Rural electrification through extension of the existing electricity grid infrastructure to these remote locations is often unviable – leaving mini-grids, especially those incorporating renewable energy, as an ideal solution.

In this study the issues and barriers to the implementation of these mini-grids have been explored through a thorough review of government legislation and programmes and select international studies. This documentary review was then followed by focus group discussions and field studies of four sites. This analysis has led to several key recommendations to accelerate the deployment of renewable energy mini-grids for off-grid electrification in the Philippines.

## DEFINITION OF ROLES AND RESPONSIBILITIES

**Remove overlaps and properly delineate roles, functions and accountabilities.** Clarification of roles and delineation among the DOE, the National Electrification Administration (NEA) and the Small Power Utilities Group (SPUG) are key to facilitating the effective implementation of the aforementioned plans, as well as the efficient use of government resources. In defining this structure, it is also essential to identify areas of coordination and set protocols to manage this.

**Acknowledge and initialise other stakeholders' roles.** The private sector, non-governmental organisations (NGOs) and local government units all play important roles. The latter two in particular have been operating informally for some time, filling some of the gaps left by central government programmes. To facilitate collaboration and the sharing of resources, these stakeholders need to be taken into account.

**Define private-sector boundaries.** In line with the Electric Power Industry Reform Act of 2001 (henceforth referred to as the "Electric Power Industry Reform Act"), areas for increased private-sector involvement should be identified, and a transition from government to private-sector control in these areas planned. Electricity cooperatives stand to benefit from private-sector involvement by gaining access to financing and technical expertise, allowing them to expand into areas they want to serve, but are unable to. Ideally, SPUG would take a proactive approach to transfer its power-generation sites to the private sector or the electricity cooperatives, thus freeing up capital to move to new, unserved areas. Likewise, the National Power Corporation (NPC) could allow for the takeover of the larger of the small areas (Small A), rather than the smaller, less viable areas (Small B).

## UNDERTAKE COMPREHENSIVE AND STRATEGIC PLANNING

### Prepare a definite plan for off-grid electrification

**Prepare the Total Electrification Plan by the NEA as mandated.** A comprehensive plan would cover clear electrification objectives and concrete strategies and programmes, with a specific section on the electrification of off-grid areas.

**Revise the current Missionary Electrification Development Plan to focus on reliable energy electricity access to small, remote and isolated areas.** This includes the provision of electricity to currently unserved areas and the improvement of service to areas with limited supply. It is advisable that the plan target the goal of supplying 24-hour electricity service that can support commercial and industrial productive uses, in turn enhancing livelihood opportunities and increasing incomes. This could be achieved by strategically using renewable energy technologies (RETs), selected based on a least-cost approach, to lower generation costs, improve reliability, increase service hours and avoid the use of fossil fuels.

**Coordinate between agencies.** Apply the consistent use of key terminology and definitions to ensure that all stakeholders have a common understanding of all plans, their objectives and targets, and that regulations are applied in line with their originally intended purpose.

### Define concrete strategies

**Define clear strategies for differentiation between grid extension and off-grid development.** Distance from existing grid infrastructure, population density and electricity demand are all factors to consider in establishing the electrification method and technology. Areas farther from the grid are better served by off-grid systems than by grid extension, for instance. Within those areas identified for off-grid electrification, mini-grids are better suited to denser communities, while small standalone technologies – such as PV solar home systems – are preferred for highly dispersed households.

**Prioritise renewable energy in small, remote off-grid areas.** Where suitable renewable resources are available, the use of RETs – either in hybrid systems or standalone – must be prioritised. These technologies can reduce generation costs and increase service reliability and service hours, while simultaneously mitigating climate change and improving climate resiliency.

## ESTABLISH A CLEAR POLICY APPROACH FOR MINI-GRIDS

**Introduce a graduation policy for the Universal Charge for Missionary Electrification entitlement.** A recommendation is made for this policy to return to the original intent of the Electric Power Industry Reform Act: to focus funds on unviable areas, and, as previously mentioned, to simplify the application process to facilitate access by smaller operators. To address the current inequality in the distribution of the Universal Charge for Missionary Electrification, a graduation policy could be introduced so that operators do not continue to receive subsidies once they reach viability. Such a policy would free up funds to develop new operations in other communities. In addition to tying up funds, continuing to subsidise operations perpetually removes all incentive to improve efficiency and introduce new technologies such as renewables.

## REVISE REGULATORY APPROACH FOR MINI-GRID PROJECTS

### Remove existing barriers to improve ease of market entry

Various factors of the off-grid market – such as small size, low capacity of consumers to pay, logistical complexities and location remoteness – make it unattractive to larger developers and investors. Smaller players have a desire to join the market, but the current regulatory framework inhibits this. The key barriers to address are excessive regulatory burdens and a lack of accessible financing.

**Streamline administrative and permitting processes.** This is necessary to remove repetitions and redundancies. It is advisable for the remaining processes to be improved to reduce costs and processing times. The Renewable Energy Service Contract approval process has been identified as a key barrier to renewable energy development, specifically its long gestation period, as well as high transactional costs. Ideally, the number of government offices involved and the quantity of signatures required for approval would be reduced to a minimum, and a separate, less stringent process stream developed for small projects (less than 200 kilowatts [kW]) implemented in off-grid areas. Likewise, qualified third-party selection and accreditation could benefit from a simplified process for smaller projects. This would allow access to the Universal Charge for Missionary Electrification for those who need it most. A simple checklist could be developed and implemented for small-scale developers, electricity cooperatives, NGOs and community organisations.

**Revise procurement rules for off-grid areas**. Considering the difficulty faced in attracting investments in off-grid areas, the use of a competitive selection process is considered inappropriate and unnecessary. Under certain conditions in these areas the continuance of this process may need to be reconsidered, and simplified alternatives such as cost benchmarking be implemented to verify the cost effectiveness of the project as well as the reliability of the developer. More complex than what?

**Improve tariff determination procedures.** Tariff determination for off-grid projects is more complex than on-grid projects, and the current practice of using on-grid feed-in tariffs (FITs) is not appropriate for off-grid projects. Tariffs for off-grid projects should reflect their higher risks as well as their increased capital and operational expenses. A streamlined process for determining tariffs would reduce processing time and offer greater certainty to potential developers and investors. It is proposed that a series for benchmark tariffs be established based on technology, system capacity and location.

## INCREASE PROJECT DEVELOPMENT AND EXECUTION SUPPORT

**Increase access to financing.** Access to both equity and loan financing is key to advancing off-grid renewable energy development, especially if more small operators are to enter the market. Government can both provide this funding directly and stimulate investment from private-sector financial institutions. The NEA, for example, should allocate a portion of its rural electrification grant funding to support off-grid development, instead of solely supporting line extension. In addition, offering loan guarantees or other mechanisms could increase private-sector investment by lowering the investment risk profile.

**Promote knowledge and understanding of renewable energy by all stakeholders.** Thorough and continuing capacity building is required for all stakeholders to improve their knowledge and understanding of renewable energy and to facilitate information exchange, both internally and internationally.

# Introduction

The transition of the Philippine electric power sector into a deregulated industry has not been easy. The introduction of privatisation and the sector's transformation into a more competitive, market-based regulatory framework resulted in a more complex industry structure with new players and operating nuances, both on and off the grid. Since 2001, many policies, rules and regulations – with progressive amendments – have been issued in compliance with the Electric Power Industry Reform Act and later with the Renewable Energy Act of 2008 (henceforth referred to as the "Renewable Energy Act").

The drive towards total electrification highlights the challenges of off-grid rural electrification. The archipelagic nature of the Philippines makes providing electricity in many isolated islands and remote communities a challenge. Diesel mini-grids are mainly used to provide limited electricity supply in these areas. The government has been covering the high cost of delivering these services, however. With the enactment of the Renewable Energy Act and the potential of bringing the private sector into these frontier areas, the Department of Energy (DOE) has recognised renewable energy mini-grids as appropriate solutions to the problem of off-grid rural electrification.

Hence, the DOE requested the assistance of the International Renewable Energy Agency (IRENA) to initiate this study. The study aims to assess the current state of off-grid electrification in the Philippines and to propose a set of recommendations to accelerate the deployment of renewable energy mini-grids for off-grid electrification with the goal of reducing diesel fuel consumption and increasing energy access in unviable, small and isolated islands and remote sites in the country.

While the Philippines has long utilised hydro and geothermal resources, their use has been mainly grid tied. Since the promulgation of the Renewable Energy Act, more capacity from renewable energy has been added to the main grid. The DOE has facilitated an increase in renewable energy generation on two large off-grid islands, Palawan and Mindoro. Still, there remains huge potential for the deployment of renewable energy, especially in smaller off-grid islands and remote areas that could benefit from the use of indigenous resources in mini-grids to increase supply availability and lower costs. This study therefore focuses on the use of renewable energy in mini-grids for off-grid electrification, especially in islands and remote communities either without or with only limited access to electricity. The study's goal is to help the Philippine government, through the DOE and its attached agencies, as well as the Energy Regulatory Commission (ERC), craft and design new policies and programmes and/or realign current administrative approaches for accelerating the use of renewable energy mini-grids to advance the country's goal of total electrification.

As the country strives to sustain its economic momentum, the government's major concern is how to attain inclusive growth that will enable its population of more than 100 million to enjoy the benefits of its improved economy. The updated National Philippine Development Plan[1] prepared by the National Economic and Development Authority (NEDA) for 2011-16 focuses not only on reducing poverty, but also on setting targets for the improvement of the overall wellbeing of its people. The Plan defines poverty as "A state of deprivation in multiple dimensions – health and nutrition, education, living standards (water and sanitation facilities, electricity, quality of housing, etc.)",

[1] *In this study, the national plan prepared by NEDA is referred to as the "National Philippine Development Plan" to differentiate it from the Power Development Plan of the energy sector.*

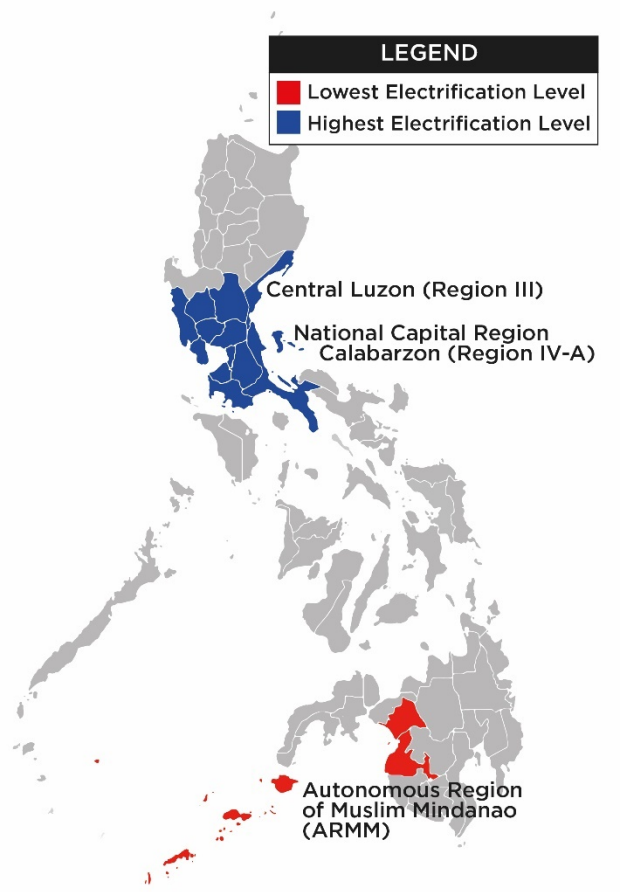
thereby bringing energy access to the forefront of its development agenda as a tool for improving Filipinos' quality of life.

The DOE's Energy Reform Agenda's 'Energy Access for More' scheme envisions the provision of access to reliable and affordable energy services to the larger population to fuel local productivity and countryside development. Three major pillars serve as guideposts in achieving this vision: (i) ensure energy security, (ii) achieve optimal energy pricing and (iii) develop a sustainable energy plan.

With population growth and shifts in settlement areas, more sitios have evolved, resulting in more area coverage for electrification, most of which are in remote and unviable off-grid locations. As of July 2016, the level of household electrification[2] in the country stood at 89.6%, leaving 2.36 million households without electricity and many other areas with a limited service of only four to six hours per day (DOE, 2016). Figure 0.1 shows the areas where electrification is at its highest and lowest.

The government has set a target of 90% household electrification by the end of 2017. As of 2014, three regions (the National Capital Region and Regions III and IV-A) had achieved more than 90% electrification. For some areas, especially those in Mindanao, energy access is still significantly below the national average. This regional variation can be seen clearly in Table 0.1, below.

Figure 0.1 Highest and lowest levels of electrification




BOX 1: ADMINISTRATIVE UNITS BARANGAYS AND SITOS

In the Philippines, a town is composed of several barangays (locality or village). The barangay is the smallest administrative unit and is governed by a duly elected punong barangay (village head). A barangay is composed of several sitios. Typically rural, a sitio is usually far from the centre of the barangay itself and it could become a barangay when its population becomes large enough.

[2] *The DOE monitors and computes the level of household electrification against the household population. This study therefore adopts household electrification as defined by the DOE as basis for analysis.*

Table 0.1 Status of Household Electrification by Region, 2014

| Region | Household population projected (2014) | Served households (2014) | Unserved households (2014) | Household electrification level (2014) (%) | Household electrification level (July 2016) (%) |
|---|---|---|---|---|---|
| **Luzon** | **12,732,284** | **11,371,252** | **1,361,032** | **89.31** | **94.8** |
| CAR | 379,910 | 317,159 | 62,751 | 83.48 | |
| I | 1,102,694 | 953,128 | 149,566 | 86.44 | |
| II | 768,500 | 641,959 | 126,541 | 83.53 | |
| III | 2,442,583 | 2,254,480 | 188,103 | 92.30 | |
| IV-A | 3,233,265 | 2,975,698 | 257,567 | 92.03 | |
| IV-B | 649,987 | 450,802 | 199,185 | 69.36 | |
| National Capital Region | 2,977,038 | 2,918,304 | 58,734 | 98.03 | |
| V | 1,178,307 | 859,722 | 318,585 | 72.96 | |
| **Visayas** | **4,128,355** | **3,296,919** | **831,436** | **79.86** | **92.4** |
| VI | 1,612,595 | 1,235,347 | 377,248 | 76.61 | |
| VII | 1,603,599 | 1,377,177 | 226,422 | 85.88 | |
| VIII | 912,161 | 684,395 | 227,766 | 75.03 | |
| **Mindanao** | **4,966,626** | **2,989,089** | **1,977,538** | **60.18** | **72.4** |
| ARMM | 563,581 | 181,173 | 382,409 | 32.15 | |
| CARAGA | 535,617 | 424,958 | 110,659 | 79.34 | |
| IX | 761,588 | 419,222 | 342,366 | 55.05 | |
| X | 998,145 | 670,129 | 328,016 | 67.14 | |
| XI | 1,094,711 | 768,084 | 326,627 | 70.16 | |
| XII | 1,012,984 | 525,523 | 487,461 | 51.88 | |
| **Grand Total** | **21,827,265** | **17,657,260** | **4,170,006** | **80.90** | **89.6** |

**Source:** (DOE, 2017a)

# 1. Review of off-grid electrification government programmes and projects

This chapter reviews current government off-grid electrification programmes and projects as a starting point for the study. Programme documents and reports were examined, and one-on-one interviews and meetings with relevant energy agencies, *i.e.* the DOE and its bureaus, particularly its Energy Policy and Planning Bureau (EPPB), Renewable Energy Management Bureau (REMB) and Electric Power Industry and Management Bureau (EPIMB), the ERC, National Electrification Administration (NEA) and the National Power Corporation (NPC)-Small Power Utilities Group (SPUG) were also undertaken to gain insights on the implementation of government policies and programmes.

## 1.1. OFF-GRID ELECTRIFICATION: INDUSTRY STRUCTURE AND PLAYERS

Prior to the Electric Power Industry Reform Act, the general practice on the main grid was for the NPC and other independent power producers (IPPs) to undertake power generation while distribution utilities distributed power to consumers within their franchise area. Thus, for areas connected to the grid, rural electrification came through extension of the power lines of electric cooperatives. On the other hand, in off-grid areas, especially in islands and remote areas, the SPUG deployed and operated diesel-based generating sets, and the electric cooperatives distributed the power to consumers through mini-grid networks.

However, due to the high cost of maintaining and operating diesel gensets, 70% of SPUG areas receive less than eight hours of electricity per day, while many other areas are left unserved. The advent of the Electric Power Industry Reform Act brought new players and redefined the roles of industry players relative to off-the-main grid and missionary electrification. The new players, *i.e.* new power providers[3] and QTPs, are to provide new avenues for serving unviable areas, bring in private capital and reduce the cost of power delivery. Appendix 1 provides a summary of industry players and their roles according to the provisions of the Electric Power Industry Reform Act and the Renewable Energy Act.

Appendix 1 shows the current structure of the energy sector in off-grid areas. The new power providers supply generation in SPUG privatised areas while the QTPs provide both power generation and distribution services in selected areas declared unviable. Non-governmental organisations (NGOs), local government units, and privately owned power systems also undertake electrification projects in areas where there are no formal industry players.

## 1.2. POLICY AND LEGAL FRAMEWORK

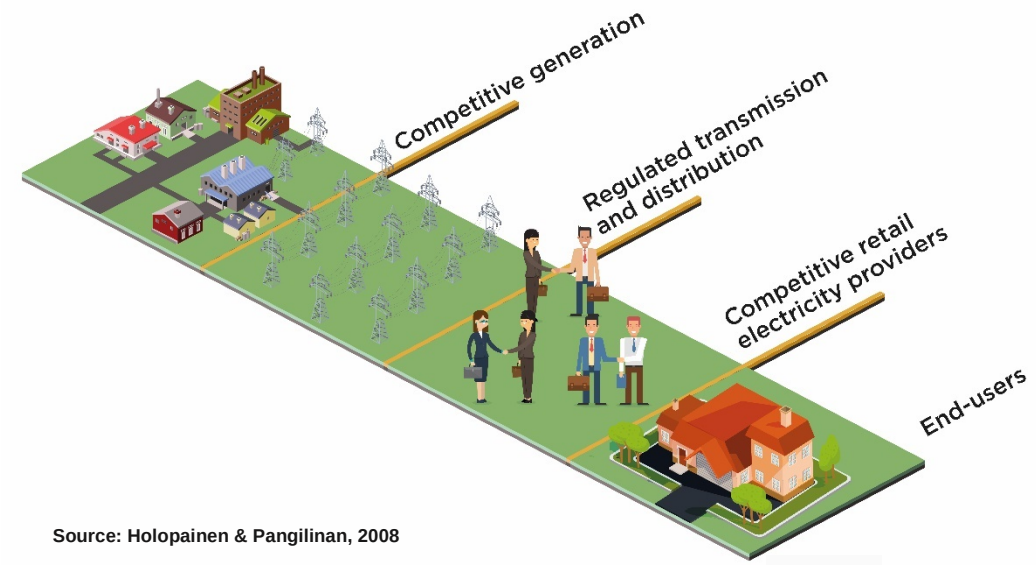
As early as 1969, the government had already mandated 'total electrification' as a matter of policy. The NEA was created through the National Electrification Administration Act to pursue total rural electrification on an area coverage basis through rural electric cooperatives. This policy was reinforced with the promulgation of the Electric Power Industry Reform Act of 2001 and subsequently by the National Electrification Administrative Reform Act in 2013. Moreover, in light of the energy sector's – as well as the country's – vulnerability to global markets and climate change phenomena, the Renewable Energy Act was passed in pursuit of the goals of energy security and environmental protection.

[3] *A new* power provider is an entity that is technically and financially capable to serve or take over existing NPC-S*PUG* areas.

## Electric Power Industry Reform Act

The Electric Power Industry Reform Act restructured the energy sector and mandated the privatisation and deregulation of the industry within a more competitive, market-based regulatory framework. Figure 1.1, below, shows the sector reform features brought about by the Electric Power Industry Reform Act.

### Figure 1.1 Electricity Reform Features




**Source: Holopainen & Pangilinan, 2008**

Moreover, the Act set some special provisions relative to the policy of rural and/or missionary electrification.[4] Figure 1.2 summarises how rural/missionary electrification is to be pursued within the context of the Act.

### Figure 1.2 Rural/Missionary Electrification in the Context of the Electric Power Industry Reform Act


[4] *The Electric Power Industry Reform Act Implementing Rules and Regulations (IRR) of Republic Act No. 9136 defines "missionary electrification" as the provision of basic electricity service in unviable areas with the ultimate aim of bringing the operations, in these areas, to viability levels. The ERC expanded this definition to include, the provision of power generation and its associated power delivery systems in areas not connected to the national grid transmission system (ERC Resolution No. 21, Series of 2011).*

The franchised distribution utilities (DUs),[5] either private investor-owned utilities or electricity cooperatives, have the full responsibility to distribute electricity in their area of coverage. If this utility or cooperative cannot connect an area, the adjoining private investor-owned utilities or electric cooperative may do so. If this is not possible, then the private investor-owned utilities or electric cooperative may waive its franchise over that area and allow a qualified third party (QTP)[6] to undertake both power generation and distribution services in said area. In the extreme circumstance that a QTP cannot connect an area, the SPUG becomes the implementer of last resort. In some cases where the SPUG cannot provide power, the electric cooperative takes the initiative to provide limited power generation. The Electric Power Industry Reform Act also provides for a Universal Charge for Missionary Electrification to subsidise missionary electrification.

### Renewable Energy Act

The Renewable Energy Act was promulgated to help reduce the country's dependency on imported fossil fuels and ensure energy security. The goal is to accelerate the exploration and development of renewable energy, promote its efficient and cost-effective commercial application, and encourage its use for balancing the goals of economic growth, including protection of health and environment. The Renewable Energy Act provides fiscal and non-fiscal incentives for using clean energy. The Implementing Rules and Regulations (IRR) of Republic Act No. 9513 specify that the "exploration, production and utilisation of natural resources shall be under the full control and supervision of the State"; hence, any renewable energy project should be implemented through a renewable energy service contract[7] between State and developer. The law creates the National Renewable Energy Board (NREB), which is tasked with recommending policies and specific actions to facilitate the implementation of the National Renewable Energy Program to be executed by the DOE and to ensure there are no overlapping and redundant functions within the government agencies concerned. The Board is authorised to monitor and review the implementation of the National Renewable Energy Program, including compliance with the Renewable Portfolio Standards[8] and minimum renewable energy generation capacities in off-grid areas.

### National Electrification Administration Reform Act of 2013

The National Electrification Administration Reform Act of 2013 was enacted to fulfil the policy of the state to "promote the sustainable development of rural areas through rural electrification". It empowers and strengthens NEA to "pursue the electrification programme and bring electricity to the countryside, even in missionary and unviable areas through the electric cooperatives". In the case of missionary areas, total electrification shall be carried out in coordination with the SPUG, which is responsible for generation and transmission requirements when other providers cannot do so.

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*[5] DUs are given the franchise to supply electricity to consumers using their electric power distribution networks. There are two types of DU: the private investor-owned utilities that operate in most urban areas, such as Metro Manila and the cities of Cebu, Davao and Cagayan de Oro; and electric cooperatives that operate in rural and peri-urban areas.*

*[6] QTP is an alternative electric service provider that meets the standards and is chosen in accordance with DOE Department Circular No. 2005DC2005-12-011; it is duly qualified and authorised by the ERC to serve declared unviable areas pursuant to Section 59 of the Electric Power Industry Reform Act and Rule 14 of the Electric Power Industry Reform Act-Implementing Rules and Regulations (IRR) of Republic Act No. 9136.*

*[7] According to Chapter 1 Section 4 (tt) of the Renewable Energy Act, Renewable Energy Service (operating) Contract refers to the service agreement between the government and developer over a period in which the developer has the exclusive right to a particular renewable energy area for exploration and development.*

*[8] Renewable Portfolio Standards refers to a market-based policy that requires electricity suppliers to source an agreed portion of their energy supply from eligible renewable energy resources.*

## 1.3. PROGRAMMES AND PROJECTS ON RURAL ELECTRIFICATION AND RENEWABLE ENERGY INTEGRATION

A review of government programmes and projects in relation to rural electrification, particularly those involving the off-grid, requires a close examination of both the macro level as well as governmental energy sector-specific plans and programmes. In this review, consistency with declared governmental policy and goals and efficiency in achieving targets are used as bases for assessing these programmes and projects. For the integration of renewable energy to off-grid electrification, the programmes were examined as to whether there is already an on-going implementation of renewable energy or if plans have identified renewable energy as a technology of choice for off-grid areas.

### National Philippine Development Plan 2017-2022

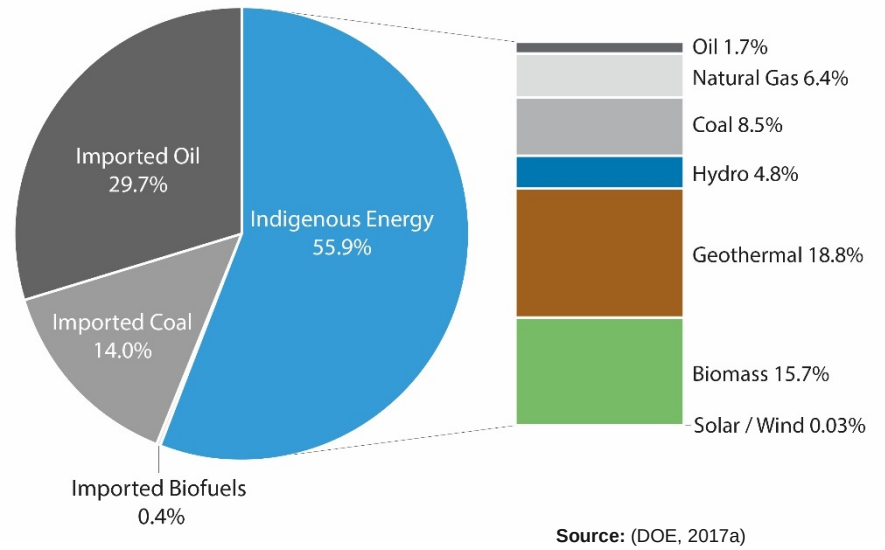
The National Philippine Development Plan (National Economic and Development Agency, 2017) is the government's roadmap to inclusive growth. The updated version of the National Philippine Development Plan presents an overarching strategic framework designed to address poverty reduction, defined in multiple dimensions:

- increasing incomes
- enhancing the provision of basic services
- increasing resilience to disasters.

This means that economic growth should not be limited to overcoming income poverty only (*i.e.* increasing incomes), but should also include improving quality of life and ensuring that such improved quality of life is maintained.

Among the strategies set to attain this vision is accelerating infrastructure development to enhance the quality, adequacy and accessibility of infrastructure facilities and services. According to the National Philippine Development Plan, the strategies will address gaps in the supply side of basic and social services to help improve human capability, reduce vulnerabilities and ultimately equalise the opportunities of development for everyone.

Figure 1.3 Energy Mix 2014



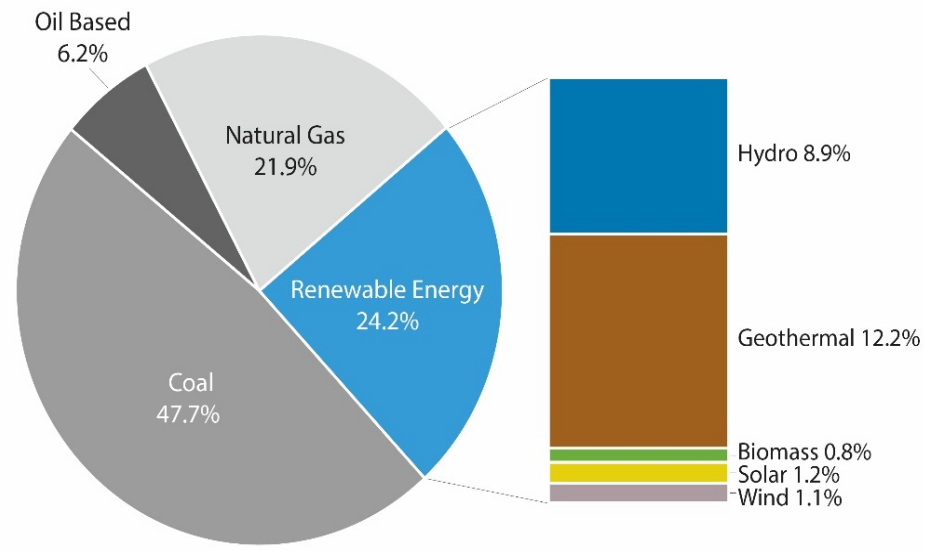

**Source:** (DOE, 2017a)

Specific to energy, the updated National Philippine Development Plan underscores attaining energy security and self-sufficiency, meeting energy demand and improving access to electricity. Energy security will be pursued by increasing energy-generating capacity, encouraging efficient use of energy and implementing various transmission projects. Electricity access was to be expanded to cover 100% of sitios in 2015[9] and 90% of households by the end of 2017. Energy self-sufficiency is projected to reach 60% of the energy mix by 2030. As of 2014, energy self-

[9] *Note that the 32,441* sitios *categorised as unelectrified in 2011 were electrified as of June 2016 (NEA, 2016), thus meeting the target of the Sitio Electrification Program. But a NEA Status of Energisation as of 31 December 2016 report states that only 83% of 142,147* sitios *are electrified.*

sufficiency was recorded at 55.9%, of which 39.3% was contributed by renewable energy, as shown in Figure 1.3

Figure 1.4 Electricity Generation Mix 2016



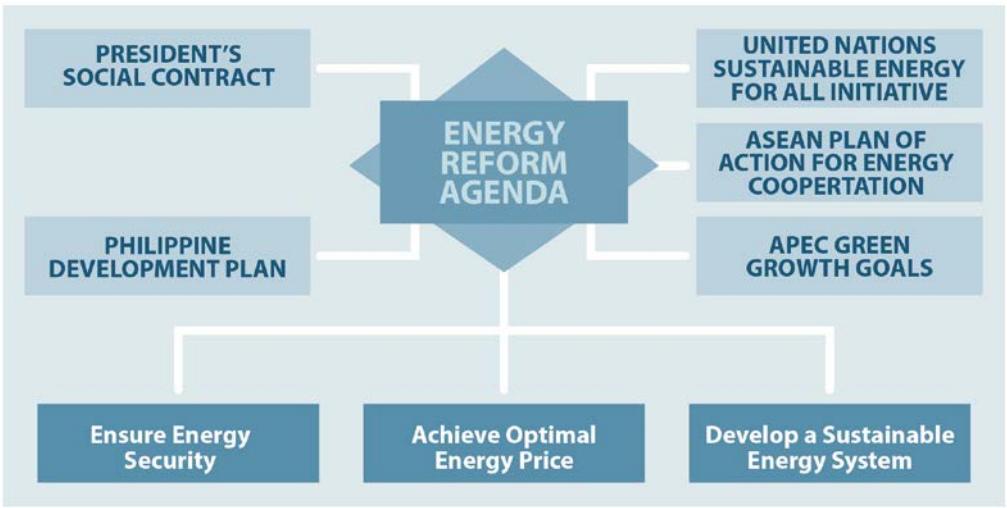

**Source:** (DOE, 2017a)

With reference to power generation specifically, an estimated 24.2% was produced using renewable energy technologies (RETs). Figure 1.4 shows the country's power generation mix as of 2016. Because the country is vulnerable to climate change, the improvement of environmental quality is essential. To this end, the Plan promotes the use of clean and environmentally friendly alternative fuels and technologies, including increasing biofuel blend and use of natural gas.

## Philippine Energy Plan 2012-2030

To implement the National Philippine Development Plan (DOE, 2011a), the DOE formulated the Philippine Energy Plan 2012-2030, which is a part of the framework of the Energy Reform Agenda outlined in Figure 1.5. The Energy Reform Agenda is drawn from the policy thrusts and goals in the updated National Philippine Development Plan that emphasises the principles of good governance, poverty reduction and empowerment. This will be done through rural electrification, rapid and sustained economic growth in the efficient delivery of services to fuel business and spur countryside develop-ment while maintaining environmental integrity through energy efficiency, and development of renewable energy and alternative fuels.

Figure 1.5 Philippine Energy Plan 2012-2030 policy framework




**Source:** (DOE, 2017b)

To achieve the desired outcomes of the Energy Reform Agenda, *i.e.* energy security, affordable energy pricing and a sustainable energy system, several programmes and actions plans were established, including:

- the 2009-2030 Power Development Plan
- the Fuelling Sustainable Transport Program
- the Indigenous Energy Development Program
- the National Renewable Energy Program
- the National Energy Efficiency and Conservation Program
- the Natural Gas Master Plan.

### 2009-2030 Power Development Plan

The 2009-2030 Power Development Plan (DOE, 2009a)involves the planning for electricity demand, capacity and production development. It also integrates the plans of the generation, transmission, and distribution sectors of the power industry. The Plan is focused on capacity additions required in the Luzon-Visayas-Mindanao Grid and the need for upgrading and expanding the transmission grid. As currently defined, the plan does not have specific plans or programmes for the off-grid areas.

### 2010-2019 Distribution Development Plan

The 2010-2019 Distribution Development Plan (DOE, 2009b) is a consolidation of the ten-year programme for the acquisition of sub-transmission assets, expansion and rehabilitation of distribution facilities and the costs associated with the activities of 122 franchised DUs throughout the country.

The distribution plan was prepared by the DUs. It provides an analysis of the impact of new facilities such as embedded generators, loads and distribution lines; plans for the expansion of the distribution system to ensure its adequacy to meet forecasted demand; and identification of ways to improve power quality and reliability in the distribution system. Among others, the Distribution Development Plan contains the complete list of barangays/sitios scheduled for electrification during the planning period as well as those areas declared remote and unviable.

The Plan has not recognised renewable energy as a solution for meeting the forecasted capacity requirements in an off-grid context. This is reflective of the Power Development Plan, which is focused mainly on infrastructure requirements on the main grid. The Distribution Development Plan, therefore, just like the Power Development Plan, does not outline any programme specific to renewable energy in off-grid electrification.

### National Renewable Energy Program

The focus of the National Renewable Energy Program is to: (i) ensure energy security, (ii) increase energy self-sufficiency and (iii) promote sustainable development. This plan focuses on the addition of renewable energy-based capacity for power generation and has established a road map for the increase, delivery and mainstreaming of each RET (geothermal, hydro, biomass, wind, solar, ocean), targeting renewable energy-based capacity to an estimated 15,304 megawatts (MW) by 2030 for on-grid areas.

Recognising the critical and indispensable support and cooperation of renewable energy stakeholders, the Plan outlines the following strategies for achieving its objectives: (i) streamlining the registration process, (ii) achieving transparency in open competition and bidding, (iii) effectively and efficiently monitoring contracts, (iv) delivering services in a timely manner, (v) conducting an integrated and aggressive information campaign and (vi) building private-public partnerships.

In streamlining the registration process, the DOE issued the department circular, "Adopting the Revised Evaluation Process Flow and Timelines of Renewable Energy Service Contracts and Mandating the Adoption of the Milestone Approach". The milestone approach means that the project development activities of companies awarded with a renewable energy service contract would be monitored according to the accomplishment of their agreed timeline and the completion of key milestones and/or targets. If milestones are not achieved, the DOE will terminate the contract. The renewable energy service contract permitting process is applied across the board to all renewable energy projects, whether big or small. The exceptions are only for own-use renewable energy systems and micro-scale renewable energy projects (below 200 kilowatts [kW]), which are developed for non-commercial purposes.[10] In such cases, the registration of projects is performed through a simplified checklist system.

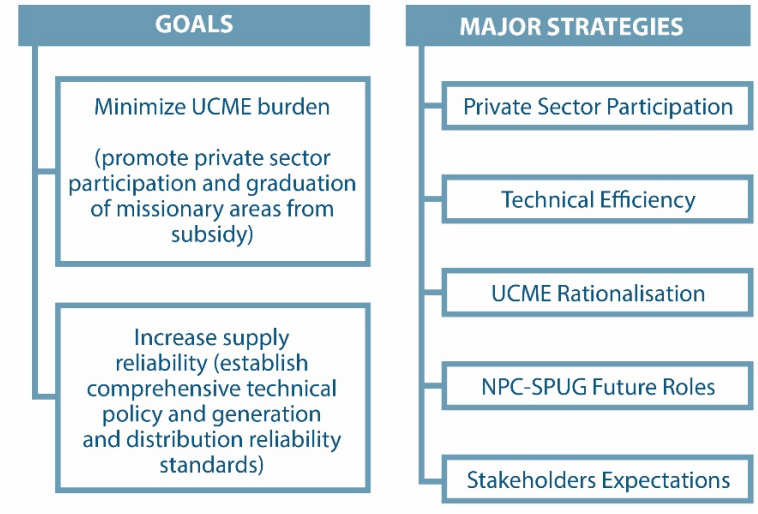
The Program does not specify any plan or programme for renewable energy development and/or its deployment in off-grid areas. Instead, the Program says, if there are renewable energy projects in the off-grid areas, they will be supported through effective coordination between the DOE, its attached agencies and the electric cooperatives. Work programmes must be aligned and harmonised with the Missionary Electrification Development Plan.

### Missionary Electrification Development Plan

Because many of the country's isolated islands and remote areas could not be served without government intervention, the Electric Power Industry Reform Act of 2001 mandated the SPUG to generate and supply power to these missionary areas. It also provides for a Universal Charge for Missionary Electrification to be imposed on all users of electricity consumers to subsidise power generation in missionary areas. The DOE is tasked with preparing the Missionary Electrification Development Plan and defining the strategies and activities to ensure the provision of electricity in missionary areas.

With 90% household electrification as its target, the DOE has prepared the Missionary Electrification Development Plan with the SPUG as the principal implementing body. The salient features of the plan are shown in Figure 1.6.

Figure 1.6 Salient Features of the Missionary Electrification Development Plan, 2012-2016




The goals of the Missionary Electrification Development Plan are (i) to minimise the burden of the Universal Charge for Missionary Electrification and (ii) to increase the supply reliability of existing SPUG operations through the following initiatives.

[10] *Own–use renewable energy systems are projects in which the power or electricity generated is consumed by the generators. Chapter IV of DOE Department Circular 2009 No. DC2009-07-0011 provides for a simplified permitting process for own-use and micro-scale renewable energy projects for non-commercial operations.*

**Private-sector participation by new power providers or QTPs.** Pursuant to the Electric Power Industry Reform Act's mandate of privatisation, SPUG areas were classified into large-scale, medium-scale and small-scale areas. Large-scale areas are composed of 14 missionary areas called First Wave Areas for private-sector participation, while 15 medium-scale areas are Second Wave Areas. The plan indicates that eight new power providers have taken over the First Wave Areas, but efforts to privatise the Second Wave Areas have not been as successful.

As part of the strategy, the small-scale missionary areas have also been classified into Small A areas, which will continue to be operated by the SPUG, while the Small B areas will be offered to third parties. This strategy of retaining the bigger areas and offering the smallest and less commercially attractive areas to the private sector appears inconsistent with the structural set-up under the Electric Power Industry Reform Act, which specifies that the SPUG is the provider of last resort. (Refer

Figure 1.7). Moreover, there is no specific mention in the plan regarding the strategy of serving areas that are not yet electrified or those where no private-sector actor is interested in serving.

BOX 2: SMALL POWER UTILITY GROUP "SMALL AREAS"

Areas with an annual generation of less than 1 GW are referred to as Small Power Utility Group "small areas" in the Missionary Electrification Development Plan, 2012-2016. These are further categorised into:

- **Small A areas** – gross annual generation above 50 MWh, but below 1,000 MWh
- **Small B areas** – gross annual generation below 50 MWh, but excluding PRES mini-grids
- **PRES mini-grids** – served by the Philippine Rural Electrification Service

The QTP, according to the Electric Power Industry Reform Act, personifies the "alternative electric service provider" for remote and unviable villages. The DOE issued guidelines for the participation and registration of QTPs and allowing them access to the universal charge. Since the issuance of the guidelines and qualifications in 2005, however, only one QTP, Power Source Philippines Inc., has registered and is currently operating in two areas, Rio Tuba in Palawan and Malapascua Island in Daanbantayan, Cebu. Another company, Sabang Renewable Energy Corporation, registered in 2015 as a QTP with a hybrid solar-diesel project in Sabang, Puerto Princesa City.

Thus, in the case of off-grid electrification, the private-sector participation programme has only managed to attain very limited success.

**Technical efficiency.** This involves the adoption of ways to improve the technical efficiency of SPUG power plants to lower generation costs, thereby reducing the burden of the Universal Charge for Missionary Electrification. Based on the Missionary Electrification Development Plan, the DOE will closely monitor SPUG performance according to the policies and guidelines on generation and distribution standards.

**Universal Charge for Missionary Electrification rationalisation.** The DOE and ERC are to enhance existing policies in electrification of missionary areas. These include (i) conducting a competitive selection process to secure power supply agreements, (ii) implementing a subsidy graduation programme and inter-class subsidy within the same small islands and isolated grids and (iii) providing incentives for renewable energy in the small islands and isolated grids. The ERC has already issued guidelines for cash incentives for renewable energy in small islands and

isolated grids, as provided for by the Renewable Energy Act, but the graduation programme for the Universal Charge for Missionary Electrification has not yet been put in place. Meanwhile, other market incentives such as the Renewable Portfolio Standards are still being reviewed by the DOE and/or are in the formulation stage.

**SPUG future roles.** Per the 2012 Missionary Electrification Development Plan, within five years of its issuance, the SPUG will no longer serve in new areas. However, it will continue to provide generation service only to missionary areas classified as Small A areas. In the future, the role of the SPUG will be reduced to that of petitioner and disburser of the Universal Charge for Missionary Electrification and system operator in large small islands and isolated grids, such as Palawan and Mindoro, as may be allowed under the Philippine Small Grid Guidelines.

The Missionary Electrification Development Plan recognises that the SPUG, ERC, NEA and DOE have a stake in collectively accomplishing its goals and objectives. Hence while the SPUG is supposed to be the principal implementing body, the cooperation and support of the NEA, the electric cooperatives, the ERC and the DOE are essential to its success.

As part of the strategy to lower the Universal Charge for Missionary Electrification, the SPUG is not allowed to open new areas. Thus, their role had been focused to that of a petitioner and disburser of Universal Charge for Missionary Electrification and operator of Small A areas. Moreover, the Missionary Electrification Development Plan does not specify any programme for unserved areas. It is not clear therefore what will happen to the unserved areas or Small B areas where no QTP is interested in operating.

Furthermore, the Missionary Electrification Development Plan has not yet defined a programme or strategy for using renewable energy in remote, isolated, dispersed areas, as specified in the National Renewable Energy Program.

### NEA programmes

The NEA is mandated to attain total electrification in the most effective and efficient manner on an "area coverage" basis through the electric cooperatives. To put this into effect, the Implementing Rules and Regulations (IRR) of Republic Act No. 10531 directed the NEA to formulate on a yearly basis a total electrification plan[11] in coordination with the SPUG, detailing time-bound targets to attain individual electrification programmes in each of the electric cooperative franchise area. At the time of writing, the NEA had not yet issued the Total Electrification Plan. However, the NEA is pursuing two major programmes, the Sitio Electrification Program and Barangay Line Extension Program, both of which are focused on extending the services of the electric cooperatives within areas that can be connected to their distribution system.

**The Barangay Line Enhancement Program** is a NEA initiative that aims to transform areas formerly served using off-grid solutions (solar home systems/solar kits or small diesel generating sets) to on-grid (connection to electric cooperative distribution lines) serviced areas (NEA, 2012). Based on the NEA's database, there are 2,341 barangays suitable for line enhancement. As of August 2015, 626 of the 1,030 barangays targeted had been enhanced (NEA, 2015).

**The Sitio Electrification Program** is one of the government's priority programmes for economic development and poverty reduction. Based on the set target of 100% sitio electrification by 2016, the Sitio Electrification Program aims to connect the remaining 32,441 unconnected sitios to the electric cooperative distribution lines. As of June 2016, a total of 32,454 sitios were

[11]Sec. 26, Rule VI, DOE Department Circular 2013-07-0015, Sec 27, "The Implementing Rules and Regulations (IRR) of Republic Act No. 10531".

connected, translating to 103% of the target set in 2011 in the Sitio Electrification Program Roadmap (NEA, 2016).

Both programs specify that "renewable energy strategies will be strongly considered in areas where conventional methods are deemed too unviable" (NEA, 2012). However, considering that they are line extension programmes, it is not clear how such a statement could be implemented. The electric cooperatives' Consolidated Five-Year Investment Plan (2015-2019) shows funding requirements for renewable projects in an off-grid system. However, there is no information as to the details of these projects. Also, the plan has not defined how they could assist and guide the electric cooperatives in implementing renewable energy projects. The NEA's main support to electric cooperatives is through loan and grant financing. But as of this writing, the NEA does not have any specific loan programme supporting renewable energy projects. But it was clarified that electric cooperatives may request an equity loan to support renewable energy projects for NEA Board approval.

The NEA's programmes as articulated in the current plans are largely focused on line extension. While the NEA is responsible for total electrification and should coordinate its planning with the SPUG in the case of off-grid or remote areas, this is not clearly practiced at present. Electrification of areas not close enough to the electric cooperative's distribution lines is relegated to the DOE through waivers of franchise by the electric cooperatives.

A reassuring development within the NEA is the establishment of the Office of Renewable Energy Development (ORED). Thus far, ORED has issued a Handbook on Developing Mini-Hydro Systems (IED, 2014). The NEA has also supported pilot renewable energy mini-grid projects by electric cooperatives in Davao Sur, Agusan Sur and Romblon in partnership with the Asian Development Bank (ADB). But for ORED to realise its purpose and meet its objectives, it must first develop and implement strategies for: (i) capacitating NEA and electric cooperatives in exploring RETs in the electric cooperative franchise areas; (ii) building a geographic information system (GIS) for referencing renewable energy sources even in the most remote areas; (iii) designing and using a tool for proper evaluation, design, sizing and costing of renewable energy integration in mini/micro grids; and (iv) integrating the use of RETs in the Total Electrification Plan.

### Small Power Utilities Group Missionary Electrification Plan 2016-2020

While the SPUG is directed to privatise its assets, it is also mandated to be the provider of power to missionary areas. Thus, the organisation charted its own Missionary Electrification Plan (DOE, 2011b), which underscores its continued presence in missionary areas. This is in contrast to the strategy of the Missionary Electrification Development Plan regarding the eventual withdrawal from off-grid areas within the next five years, except for the Small A areas[12] and that of the PRES, a special project in Masbate.

Between 2016 and 2020, the SPUG plans to undertake the following:[13]

- re-fleet existing plants, capacity additions and increase operating hours
- electrify new areas, which includes use of mini-grids
- add capacity to accommodate additional demand resulting from the Sitio Electrification Program and the Barangay Line Enhancement Program
- convert existing diesel plants into hybrid solar/wind diesel plants
- implement Renewable Portfolio Standards once guidelines are issued.

Based on its Missionary Electrification Plan, the group has identified a number of existing and potential renewable energy projects totalling 191 MW. It also plans to integrate and hybridise

[12] *Refer to Box 2 on page 17 for definition*
[13] (Mendoza, 2015)

existing diesel power plants using wind and solar generation with an estimated total capacity of 2,074 kW. These projects are in various stages of planning and implementation.

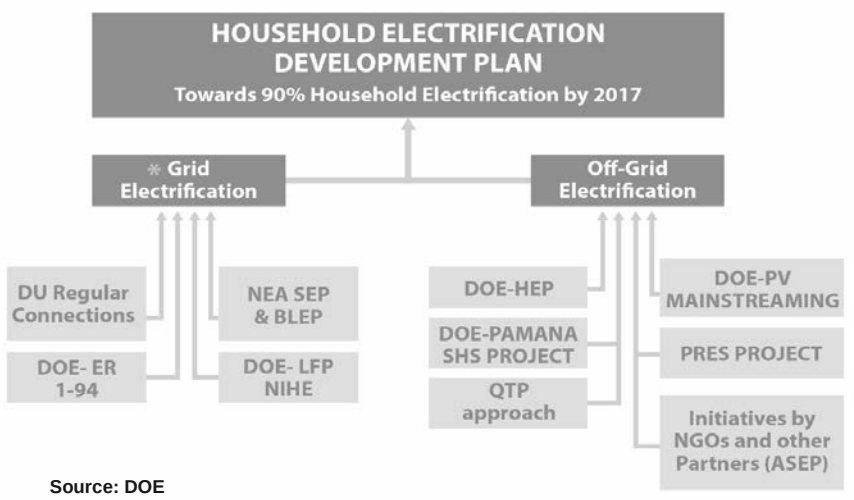
### Household Electrification Development Plan 2013-2017

The Household Electrification Development Plan (DOE, 2013) aims to unite the various programmes that are currently being implemented by various energy agencies. Because some of the agencies' energy plans lack household electrification targets, it will serve as one cohesive plan that will draw the various programmes together towards a common goal of providing electricity to households.

The Plan aims to facilitate accelerated electrification in order to reach the government's goal of 90% household electrification by the end of 2017 and thus "ensure that every Filipino family shall have an equal opportunity to access basic electricity services". Basic electricity service is defined as "the minimum amount of electricity to be provided to every Filipino family in order to promote just and equal opportunity for poverty alleviation and improved quality of life." (DOE, 2012) The Plan does not define the minimum level or capacity to be provided for a household to be considered energised. However, as practiced, it could be inferred that the minimum is equivalent to the level of service that can be derived from a solar home system, a solar kit or about four hours from a diesel mini-grid. The various components of the plan are presented in

Figure 1.7.

Figure 1.7 Household Electrification Development Plan




Source: DOE

The DOE leads the implementation of the Household Electrification Development Plan and programmes focused on household electrification as follows:

- DOE Alliance for Mindanao and Multi-Regional Renewable Energy Development III or AMORE III Program (October 2009-September 2013) and other solar home system electrification initiatives by community organisations, NGOs and other civil society partners funded by the DOE.
- Nationwide Intensification of Household Electrification, which has the following components: (i) grant assistance of PHP 3,750 (USD 75.57) per household for wiring installations to at least 475,000 households for the period 2015-17, (ii) re-connection of households affected by calamities, (iii) provision of solar photovoltaic (PV) re-chargeable lamp-kits as minimum basic electricity service to dispersed households, and (iv) Palawan Electric Cooperative – Payapa at Masaganang Pamayanan, a national

government peace and development framework that responds and strengthens peace building and reconstruction in conflict-affected areas.

- PV mainstreaming or electrification of off-grid areas through solar home systems under a Fee-for-Service Business Model, where the distribution utilities own, install and maintain PV solar home systems and the consumer pays a one-time participation fee and a monthly fixed fee equivalent to the ERC-approved solar home system tariff.
- The Household Electrification Program, which involves the electrification of off-grid areas using mature renewable energy resources such as PV, solar home systems, PV streetlights and micro-hydro systems. While the AMORE, Nationwide Intensification of Household Electrification Development Plan and PV mainstreaming are implemented by DOE-EPIMB, the Household Electrification Program is being implemented by the REMB. The programme is to be implemented over a seven-year period (2011-17) to achieve the same objective of 90% house connection level by 2017 targeting 26,900 households in remote and dispersed areas. Micro-hydro projects will also be implemented in Palawan and Negros Occidental through the Affiliated Renewable Energy Centers.

To achieve the objectives of the programmes under the Household Electrification Development Plan, the DOE created the Household Unified Strategic Electrification team. The team is composed primarily of DOE officials, which implies that the DOE has assumed the responsibility of actual implementation of the household electrification programme. This role overlaps with the roles and functions of the NEA, electric cooperatives and the SPUG, removing clear boundaries between policy and planning agencies and implementing organisations. Moreover, within the DOE itself, both the EPIMB and REMB are implementing similar projects.

Under the Household Electrification Development Plan, the use of renewable energy sources is likewise observed to be only a “preferred option”. REMB officials clarified that under the Household Electrification Program, REMB is implementing solar home system projects as a temporary measure until the unviable area can be connected to the DU’s distribution system. On the other hand, solar home systems and solar PV rechargeable kits are distributed as electrification alternatives, and households with these kits and PV are considered electrified by the DOE. Thus, as it is, while some renewable energy projects are being undertaken as alternatives for household electrification, the strategic role of RETs in off-grid and unviable areas is not yet clearly defined in the existing plans.

## 1.4. POLICY AND REGULATORY INITIATIVES

The DOE and ERC have dedicated many years to developing and promulgating policy and regulatory frameworks in compliance with the Electric Power Industry Reform Act and Renewable Energy Act. Indeed, much has been done, but 16 years after the promulgation of the Electric Power Industry Reform Act and nine years into the implementation of the Renewable Energy Act, the desired outcomes have not yet been fully achieved. A review of these policies and the regulatory framework, as well as administrative procedures, would help to define what can be done to further improve and enhance what has already been accomplished.

So far, in terms of off-grid electrification, efforts have focused on enabling the privatisation of SPUG operations and the electrification of missionary areas – either by the group itself or by the QTPs – and renewable energy development. These include:

- guidelines and regulations on the privatisation of SPUG operations (entry of new power providers)

- guidelines mandating the Competitive Selection Process
- guidelines on the selection and registration of QTPs
- guidelines on Renewable Energy Service Contracting
- guidelines for availing of incentives for renewable energy development.

The privatisation of NPC assets by the Electric Power Industry Reform Act is intended to reduce the dependence on government resources for power generation in more viable areas and increase the availability of said resources for further expansion into currently unelectrified areas. However, even after the privatisation of assets in the First Wave areas, subsidies continue. The new power providers that have taken over SPUG assets are entitled to and still collect Universal Charge for Missionary Electrification subsidies. As for QTPs, having policies and guidelines in place was not sufficient to entice more private investors to venture into off-grid areas.

In the case of the Renewable Energy Act, guidelines primarily focus on power generation in the main grids of Luzon, Visayas and Mindanao, with regard to measures such as feed–in-tariffs (FIT) and net metering. To benefit from incentives, renewable energy developers must enter a Renewable Energy Service Contract or Biomass Renewable Energy Operating Contract with the DOE. As noted earlier, these contracts' guidelines and rules apply to both on-grid and off-grid projects. There is no distinction in the rules as to type and capacity of projects; thus, small-scale, off-grid projects have to comply with the same requirements as those of large-scale, on-grid projects. So far, the ERC has issued only one guideline relative to off-grid electrification: the guideline on cash incentives for renewable energy power generation in missionary areas. Other rules, such as Renewable Portfolio Standards for off-grid areas, are still under study. Guidelines on several other provisions of the law are yet to be put in place, including provisions on the Renewable Energy Market and Renewable Energy Registry, Green Energy Option, and Renewable Energy Trust Fund. The NREB's role in recommending actions to the DOE is critical to facilitate the implementation of the Renewable Energy Act.

### Renewable Portfolio Standards

The NREB technical working group is still deliberating the Renewable Portfolio Standards for off-grid areas. The Renewable Portfolio Standards are intended to aid in accelerating the deployment of renewable energy sources in off-grid areas by mandating that a minimum percentage of renewable energy generation and supply comes from renewable energy. However, at this point, there are still several questions to be answered with respect to this matter. These include who should be mandated: the developer, the distributor or franchisee, or both? Other outstanding questions include whether there should be any exemptions and whether the mandate will be area-based or franchise-based, in the case of the DUs.

### Amendment to the QTP guidelines

The relative failure of the QTPs to take off despite the early issuance of the guidelines for QTP registration and operations has prompted the DOE to review and amend the policies and regulatory framework for the entry of third parties in off-grid areas. Although a draft amendment to the QTP guidelines has been completed and subjected to public consultations, it is noted in the amended guidelines that it has not streamlined the administrative process. The same rigorous process of registration and application for service and/or operating contracts is applied to all projects regardless of size or technology. Moreover, renewable energy developers must pass through two qualification processes: first, when they apply for QTP registration; second, when they apply for a renewable energy service contract. These intensive requirements may be revisited because they tend to deter rather than encourage the entry of private-sector actors. It may be pointed out that the guidelines for QTP and renewable energy service contracts should not be taken in isolation of each other. Project developers must undergo both processes when they implement renewable energy projects. Streamlining and

simplifying the process would help to facilitate and reduce compliance costs, both in terms of time and financial resources.

In June 2015, the DOE launched the Energy Virtual One Shared System, a web-based application processing and monitoring system aimed at shortening the time it takes to obtain the necessary permits to start a renewable energy project. At the time of writing, the system was partially operational, but some aspects were yet to be implemented (DOE, 2017a).

### Universal Charge for Missionary Electrification subsidy: Entitlement, graduation policy or degression strategy

Under the Electric Power Industry Reform Act, all electricity end-users are mandated to pay a universal charge to fund missionary electrification as determined by the ERC. The amount of subsidy for each area is based on the cost of generation over and above the subsidised approved generation rate charged to electricity consumers, likewise determined by the ERC. Since the NPC has been given the missionary electrification function, the ERC has allowed the operations in all SPUG areas to be subsidised from the Universal Charge for Missionary Electrification funds. Such subsidies are further transferred to new power providers once they come in under the SPUG's privatisation programme.

The high cost of operating diesel-fuelled gensets has caused some concerns about the continued availability and sufficiency of the universal charge. Unlike the FIT rules, there is no degression policy[14] in place for the Universal Charge for Missionary Electrification. Due to the lack of guidelines on graduation of off-grid areas from Universal Charge for Missionary Electrification coverage, the SPUG used the increase in fuel cost as the basis for proposing an increase in the subsidised approved generation rate to effectively reduce subsidies from the Universal Charge for Missionary Electrification. This strategy, however, is simply a stopgap measure.

This concern highlights the issue of Universal Charge for Missionary Electrification entitlement and the need for a graduation policy or degression strategy. Based on the Implementing Rules and Regulations of Republic Act No. 9136, missionary electrification refers to the provision of basic electricity to unviable areas. However, no clear definition has been decided upon for determining which areas are unviable, creating confusion and inconsistent application of the term. The ERC has directed the SPUG to conduct socio-economic studies of SPUG areas so that those areas that are already viable may be graduated or weaned from Universal Charge for Missionary Electrification dependence. But to date, the group has not yet initiated the implementation of these studies. Moreover, the pressure on the Universal Charge for Missionary Electrification is aggravated by the fact that ERC has allowed all SPUG areas not connected to the main grid to be entitled to the subsidies. Thus, even the new power providers in large off-grid islands that had been privatised under the First Wave SPUG areas are still receiving these subsidies. Effectively therefore, a large portion of the funds go to the larger islands with continuous electricity service, while the remote islands and isolated areas receive substantially less, and for limited service hours.

Moreover, there appears to be a contentious issue regarding the eligibility of electric cooperatives to access the Universal Charge for Missionary Electrification. As currently practiced, only the SPUG, new power providers and QTPs have been given access to the Universal Charge for Missionary Electrification. Electric cooperatives are not considered eligible for the subsidies because they are not third parties. This raises the issue of entitlement. If the Universal Charge for Missionary Electrification is for unviable areas as mandated under Electric Power Industry Reform Act, then electric cooperatives should be allowed to access the subsidies

[14] *FIT rules mandate a systematic degression in FIT rates per technology (ERC, 2010).*

to encourage them to energise unviable isolated islands and remote areas within their franchise areas, instead of waiving them in favour of QTPs.

### Rate setting for off-grid rural electrification

The ERC carries out the rate setting function for the energy sector. It is therefore responsible for the evaluation of each application, including holding public hearings in remote, off-grid areas for all systems – even very small ones, such as solar home systems. This puts a heavy burden on ERC's limited staff, resulting in critical delays and backlogs.

As an example, the Philippine Rural Electric Cooperatives Association (PHILRECA) has filed a petition to adopt a methodology for setting a benchmark tariff in which solar home system households are grouped together into cost zones. These zones are defined by their distance to the nearest office of an electric cooperative. Zone A is less than 40 km and Zone B 40-45 km to the nearest office; Zone C is more than 45 km to the nearest office and includes small islands and islets. The proposal has three components: (i) base operating costs, (ii) overhead costs and (iii) replacement costs. It also provides for incremental cost adjustments for personnel allowance and transportation costs, which is necessary for taking care of solar home system customers in remote and dispersed areas. To be able to rule on this case, the ERC must evaluate the cost components of each zone and conduct rate hearings in selected areas representing each zone. With limited personnel, delays in tariff approvals are inevitable. Therefore, a need exists to formulate a more efficient way of evaluating tariffs than one-on-one public hearings.

### Proposed Distributed Generation and Renewable Energy Deployment Roadmap

The NREB, in its proposed Distributed Generation and Renewable Energy Deployment Roadmap, recommends the provision of mechanisms and incentives to new power providers and QTPs to deploy renewable energy in off-grid areas and for the SPUG to be granted the authority to enter contracts to accelerate the shift from diesel power plants in off-grid areas to hybrid systems. The Electric Power Industry Reform Act, however, prohibits the SPUG from entering any contractual obligations. To work around this issue, the NPC uses direct procurement of the solar equipment under a turnkey arrangement instead of entering into an IPP-type contract. The NPC was able to access funds for this under the General Appropriations Act (National Budget).

## 1.5. OBSERVED ISSUES AND GAPS

The goal of the study, according to DOE Director Mario Marasigan, is to urge the government to identify ways to improve and attain sustainable energy access using renewable energy solutions. In light of this goal, this review of government policies, plans and programmes identified several issues and gaps. When these are resolved, the twin objectives of increasing energy access and reducing the use of fossil fuel in off-grid rural electrification will be more easily attained.

### Terminologies and concepts

Having a common definition or understanding of the terminologies used in goal setting and implementation among stakeholders is essential to attaining success. Among the concepts and terminologies that require clarification are:

**The concept of electrification**. From the review, it is noted that there appear to be two concepts regarding electrification. One is that electrification means providing the infrastructure, *i.e.* line extension, that would allow potential consumers to gain access to the source of electricity. The other concept is the actual delivery of electricity to households. These two concepts, while not necessarily opposed to each other, create confusion when used interchangeably, especially in target setting. For instance, the NEA assists electric cooperatives to extend their distribution

lines and already considers this to be electrification, while to the DOE, "electrification" means the household must be consuming electricity.

In the first concept, the target is kilometres of lines extended or number of sitios connected to the grid. Thus, there is a tendency to proceed with line extension even when there is no power available. We see this in some areas where distribution lines have been erected but no power generation and/or supply is available. On the other hand, the second concept promotes the deployment of RETs such as solar home systems or solar PV rechargeable kits as the lowest cost method to increase electrification statistics, even if mini-grids may be the better option. To strategically respond to the goal of total electrification, the definition of what is electrification needs to be clarified, especially among the government's energy agencies.

**Energy access and level of service**. In any of the department circulars of the DOE, there seems to be no definition referring to energy access. If energy access means actual delivery of services, the acceptable level of service is unclear. Different criteria are set for this among industry players. For the SPUG, only a minimum level of service (four to six hours of electricity in a mini-grid area) is expected, while the new power providers are required to provide full 24-hour service. As for the deployment of solar home systems, these are considered only as pre-grid electrification by REMB and therefore not expected to provide full services. The DOE-EPIMB, however, in its monitoring of electrification status, recognises households with solar home system deployment and those with solar lantern and kits as already electrified.

According to the International Energy Agency (IEA), there is no single internationally accepted and internationally adopted definition of modern energy access (IEA, 2017). Yet significant commonality exists across definitions, including:

- household access to a minimum level of electricity
- household access to safer and more sustainable (*i.e.* minimal harmful effects on health and the environment) cooking and heating fuels and stoves
- access to modern energy that enables productive economic activity, *e.g.* mechanical power for agriculture, textile and other industries
- access to modern energy for public services, *e.g.* electricity for health facilities, schools and street lighting.

Energy agencies, led by the DOE, must come to agreement on the definition of the minimum level of household energy access. If one must consider the goal of inclusive growth and rural development, then the level of service must go beyond lighting to include capacity for supporting other basic services (water supply, education, etc.), as well as productive use applications, at least for those areas where mini-grids can be developed.

**Missionary electrification versus off-grid electrification.** The term "missionary electrification" is not defined in the Electric Power Industry Reform Act. However, the Implementing Rules and Regulations of Republic Act No. 9136 define it as "provision of basic electricity service in unviable areas with the aim of bringing the operations in these areas to viability levels". The unviable character of unserved areas and their distance from the distribution lines of franchised cooperatives prompted policy makers to coin the term "missionary electrification." But since the mandate for missionary electrification was given to the SPUG, the ERC has expanded its definition to include the provision of power generation and its associated power delivery systems in areas not connected to the national grid transmission system (Energy Regulatory Commission Resolution No. 21, sec. 2011) (ERC, 2011), or essentially, off-the-main-grid areas. This expanded definition therefore includes all areas being operated by the SPUG, many of which have long been served (prior to the Electric Power Industry Reform Act) through mini-grids and are not necessarily unviable areas.

This expanded area coverage is now putting pressure on the Universal Charge for Missionary Electrification. For example, mid-sized islands such as Palawan and Mindoro, which have been fully privatised, are currently receiving the bulk of subsidies from the Universal Charge for Missionary Electrification. With this continuing subsidy, there is no incentive for the new power providers to look for more cost-effective means of delivering power supply services other than the same diesel-based option used by the SPUG, because they receive subsidy for their high generation cost anyway. Moreover, if one follows the definition that all off-grid areas are classified as missionary areas, then all islands covered by the SPUG, past, present, and future, will never graduate from being classified as missionary areas and thus will forever be entitled to Universal Charge for Missionary Electrification subsidisation.

Clearly, not all off-grid areas are missionary areas. There is therefore a need to revisit the missionary area definition and to produce a clear policy on entitlement to the Universal Charge for Missionary Electrification subsidy so that it can be properly directed to areas that are truly missionary or unviable in nature in accordance with the intent of the Electric Power Industry Reform Act.

**Mini-grid and micro-grid.** It is necessary to clarify the meaning of and differences between the terms “mini-grid” and “micro-grid”. Is there any difference in the treatment of a mini-grid versus a micro-grid in the policy and regulatory framework? The EPIMB of the DOE currently defines mini-grids as those that serve two or more barangays, while a micro-grid serves only a single barangay. In this definition, the determining factor is the number of barangays served, not the size of the system. A better way of classifying these two systems other than the consideration of the area served should be identified.

Agreement on the definition of mini- and micro-grids is essential, especially when it is applied to the classification of projects for the purpose of regulation. For example, a regulatory framework for micro-grids may be developed separately from mini-grids in larger islands to direct investments to the more isolated areas.

## Policies for renewable energy in off-grid areas

### Policy of total electrification

Total electrification is a policy and goal repeatedly pronounced by government in various laws and in the Philippine Development Plan 2017-2022. The country’s electrification status stood at 80.9% based on household count, according to 2014 DOE data (DOE, 2014). The Missionary Electrification Development Plan is expected to define the strategies for electrification of the remaining un-electrified households. However, the current plan is focused on reducing subsidies and improving efficiencies and supply reliability in current SPUG operations. The plan does not mention the electrification of unserved areas as part of its objective or target. The restriction on the SPUG, the agency mandated with provision of power in missionary areas, to expand to new areas appears inconsistent with the policy of total electrification and the national goal of inclusive growth and rural development.

Although it is clear that new power providers and QTPs are allowed and encouraged to step in, the SPUG is still expected to serve areas where the private sector is not capable of or interested in serving. Thus, in its own separate Missionary Electrification Plan, SPUG has planned the electrification of new areas as well as the hybridisation of current diesel-based operations with renewable energy power generation. However, because the SPUG is restricted from undertaking new contracts, it is not clear how these planned courses of action will be implemented.

### Role of renewable energy in off-grid rural electrification

From a review of both the macro energy plan and the action plans being undertaken by various energy-related agencies, it appears that the role of renewable energy in off-grid rural electrification has not yet been strategically defined. At best, renewable energy is viewed only as a preferred option. Of the plans prepared by the various agencies, only the SPUG's Missionary Electrification Plan includes a strategy to hybridise existing power generation facilities with renewable energy. Although the NEA has created the ORED, the electric cooperatives have yet to include the use of renewable energy in their plan for the off-grid areas. The NEA likewise does not yet include clear support of renewable energy in its financing programmes, except support for equity loans for special Board approval. Moreover, the Missionary Electrification Development Plan does not have any renewable energy component either. Thus, the plans and programmes as currently crafted are deficient in integrating renewable energy in off-grid electrification and could benefit from revision.

### Policies, regulations and permitting processes

With the passage of the Renewable Energy Act and with all the fiscal and non-fiscal incentives it offers, it became necessary for the DOE and the ERC to draft rules to regulate the entry of renewable energy to the market and to define who could qualify for the incentives and how they will be granted. Today, developers must comply with several sets of rules to implement renewable energy projects, making market entry more complicated. On the other hand, the Electric Power Industry Reform Act has allowed the entry of new players in off-grid areas.

Reconciling the provisions of these two laws is necessary. Stakeholders point to the need to streamline and harmonise policies relative to the entry of renewable energy as well as private-sector investments, especially in remote off-grid areas. Stringent rules as well as lengthy administrative and permitting processes are cited among the hurdles that private companies and even electric cooperatives have to deal with if they want to invest in remote, off-grid renewable energy projects. A review of the process for renewable energy service contracts has identified 156 signatures needed for the application to be approved. As noted above, rules and regulations formulated for on-grid renewable energy power generation also apply to off-grid projects, even for very small-scale renewable energy projects in small isolated island areas. These lengthy and arduous procedures dampen interest in bringing much-needed investments to these remote and commercially challenging areas.

The following policies, rules and regulations should be revisited:

- **Renewable Energy Service/Operating contract** – to address specific needs and the applicability of requirements in remote off-grid areas. For small-scale renewable energy applications, requirements may be simplified or replaced, and some exemptions may be considered.
- **New power provider and QTP registration, selection** and Universal Charge for Missionary Electrification **application** – to streamline and avoid duplication of review processes by DOE-REMB and EPIMB, as well as the SPUG.
- **Tariff determination** – to clear backlogs caused by the tedious process of tariff determination and remove stress on ERC staff; benchmarking/distinction between capacities of projects may be considered.
- **Universal Charge for Missionary Electrification entitlement and graduation policy** – to redefine entitlement based on the unviability of areas served, regardless of generator (whether the SPUG, electric cooperative or private investor) and to remove viable areas from coverage of the Universal Charge for Missionary Electrification.

It is noted that there are already efforts within the DOE to revise some of these procedures; however, the revisions so far have not addressed the more fundamental issues of lengthy processes and stringent requirements. The rules may be further clarified and made more investor-friendly and transparent. For example, to encourage investments in small and isolated areas, rules may be adjusted to relieve smaller projects below 200 kW from going through the same stringent rules and lengthy processes as that of large-scale projects.

## Planning and implementation of renewable energy in off-grid electrification

### Roles of players in off-grid electrification

The review of the plans and activities being undertaken by government agencies revealed some duplication and overlap in the functions and roles played by various players, particularly the three main energy agencies – the DOE, NEA and the SPUG – because all are undertaking electrification activities. Furthermore, DUs also have an exclusive franchise and therefore are obligated to also provide electricity services to their entire coverage area, including remote areas and islands. These overlaps in the functions and roles of players, particularly those of energy agencies, highlight the need to clarify, define and establish which organisation holds the main responsibility and accountability for the implementation of the country's rural electrification programme, both on-grid and off-grid. Is it the DOE, the NEA or the SPUG?

Overlapping functions do not foster good governance. They result in inconsistencies in strategy and prevent agencies from identifying more cost-effective and synergistic ways of implementing off-grid electrification programmes. They can also propagate the inefficient use of financial and human resources. For example, because the NEA is concentrating only on line extensions, it will support the extension of lines to distant and remote areas even if the more cost-effective option is to use a mini-grid approach. Moreover, the relegation of the electrification of off-grid/unviable areas to the DOE could also make the DUs and the electric cooperatives complacent with regard to their franchise obligations, because they can easily waive their franchise in these areas and expect the DOE to electrify them through solar home systems or QTPs.

In 2013, the NEA was mandated to prepare a Total Electrification Plan. At present, no such plan exists. With this mandate the NEA could call on all the agencies concerned to participate in and use this opportunity to clarify goals, strategies, roles, functions and processes towards a more cohesive, coordinated, efficient and effective rural electrification sector. This could also be an opportunity for the energy sector to define boundaries and demarcations where renewable energy mini-grids could be more cost-effective and where the private sector would be allowed to operate without government crowding out its activities. The NREB, which under the Renewable Energy Act is charged with ensuring that there will be no overlapping and redundant functions within government entities in the implementation of the National Renewable Energy Program, could be tasked to lead this role-clarification process.

### Awareness level and capacity building for stakeholders

The awareness level about renewable energy is still low; many still believe that renewable energy is expensive, and because these technologies are intermittent, they are therefore considered inferior to coal and oil-based power generation systems. There is still insufficient capacity for renewable energy project development and assessment even within energy agencies. Renewable energy information, education and capacity building are therefore essential gaps to be filled. These capacity-building efforts need additional development, as renewable energy is inadequately reflected in the current plans of energy agencies.

### Renewable energy viability issue

The use of RET addresses both the cost and service delivery issues in off-grid rural electrification. Simple household demand, however, does not justify renewable energy

development in off-grid areas. It is therefore critical to go beyond household lighting and to generate commercial and productive uses of electricity to increase the load demand and improve the income generation capacity of households. Reliable databases are necessary for forecasting load demand and, in most cases, these are not available. Since most off-grid areas have a limited supply of power, interested investors and developers have difficulty forecasting load demand on a 24-hour-a-day, seven-day-a-week basis. Moreover, there is not only no systematic planning for renewable energy deployment in off-grid areas, there is also no planning hand-in-hand with productive use applications. Coordination among energy agencies, local government units and other social and development agencies at the grassroots level is not common practice.

#### Technology development and innovation

In the past decade, there has been significant progress in RETs, resulting in the reduction in unit prices, greater capacities and efficiencies, automation, better storage and so forth. At present, there appears to be no programme that monitors and/or studies the applicability of these new technologies in the local setting. It should be noted that the publication *Innovation Outlook: Renewable mini-grids* (IRENA, 2016a) could provide useful guidance with regard to current and upcoming technology trends for mini-grids.

## 1.6. CONCLUSION

Since the promulgation of the Renewable Energy Act, there have been renewed efforts to accelerate the use of renewable energy resources in the country in line with the goals of total rural electrification and energy self-sufficiency. With the declining trend in the prices of RETs, the deployment of renewable energy mini-grids in off-grid areas has become a more attractive solution to enhancing power supply, increasing energy access and reducing costs of power generation. However, current government plans, programmes and projects have yet to integrate renewable energy as a noteworthy medium for off-grid rural electrification. At best, it is regarded only as a preferred option, such that only a few projects applying RETs in small island mini-grids have actually been installed so far.

But while RETs can provide a more cost-effective solution to the concerns of off-grid rural electrification – particularly that of limited services due to the high diesel generation and service delivery costs – their development in off-grid areas is not an easy or popular proposition. The issues and gaps discussed in this chapter point to policy, regulatory, programme implementation, technology, economic and information deficiencies that must be addressed. Most significant of these is the current regulatory framework governing renewable energy for small-scale, off-grid application, which to some extent acts as an implementation barrier rather than an accelerator. Likewise, the low level of awareness and knowledge about the technologies among stakeholders is a barrier to the increased use of RETs. Thus, there is a need to develop a unified and comprehensive programme for off-grid electrification with a strategic focus on the use of renewable energy mini-grids to optimise their role in reducing power generation costs. This would accomplish the national goal of reaching the farthest end of the Philippine archipelago in order to achieve inclusive growth, energy security and resiliency for the Filipino people.

# 2. Review of international studies

## 2.1. INTRODUCTION

Several international organisations have been studying the possibility of using renewable energy mini-grids for rural electrification. These studies are either specific to the Philippines or classify the Philippines as a country of interest. As part of this study, a review of the findings by international organisations on this topic has been conducted to provide a wider context for this study and to ensure coordination with, or at least consideration of, other work in the field of rural electrification in the Philippines. This review also offers the opportunity to evaluate the issues and successes of previous studies and project implementations and to incorporate lessons learnt.

Four related studies and reports prepared by international organisations were selected for this review. One of the studies was prepared by the Deutsche Gesellschaft Für Internationale Zusammenarbeit (GIZ), two were prepared for the DOE by the Innovative Energie Developpment (IED) and one was published by the Frankfurt School of Finance and Management-United Nations Environment Programme (UNEP) Collaborating Centre for Climate and Sustainable Energy Finance.

These studies have been selected because they offer a range of perspectives and useful insights relevant to this study, covering the following topics:

- the economics and business cases for renewable energy mini-grids
- technical study of the optimisation of an existing diesel mini-grid with the integration of renewable energy
- evaluation of the potential for renewable energy in the field of missionary electrification
- evaluation of the implementation of the PRES Project.

## 2.2. RENEWABLE ENERGY IN HYBRID MINI-GRIDS AND ISOLATED GRIDS: ECONOMIC BENEFITS AND BUSINESS CASES

Published by Frankfurt School of Finance and Management-UNEP Collaborating Centre for Climate and Sustainable Energy Finance, 2015 with support from IRENA and SIEMENS.

### Summary

This study was commissioned by UNEP and supported by IRENA and Siemens. It examines the power situation in seven off-grid and isolated areas across four continents, most of which depend on diesel plants that are expensive to operate. One of the off-grid areas covered by this study is Busuanga Island in the Philippines.

In the case studies, regulatory, technical, commercial and financial concerns were considered to determine whether a renewable installation is advisable and if it will indeed result in a lower energy costs. The use of renewable technology, particularly solar installations, is considered as a possible solution.

Concrete risks and roadblocks experienced in developing power projects in off-grid areas are identified and addressed in the study. Important project development issues and concerns, applicable to both public and private entities and other stakeholders, are highlighted.

The study also identifies the different factors and perspectives that must be weighed when comparing diesel-only electricity costs with hybridised mini-grid electricity costs. It shows how the levelised cost of energy (LCOE) reacts to different variables such as capital expenditure (CAPEX), operating expenses (OPEX) and financing costs. It also examines whether a simple comparison of diesel and solar generation costs is reflective of the savings (or lack thereof) derived from a renewable source of energy.

Moreover, the study recommends a review of current policies as well as procedural and permitting matters relative to the entry of renewables in off-grid areas, whether in hybrid with diesel or without. Policies and procedures can be tedious and complicated. Perceived regulatory risks coupled with the high financing costs of RETs are deterrents that could make investments unattractive to the private sector.

The study finds that hybridisation of diesel plants with solar PV lowers the cost of electricity generation in five of the seven sites examined. As noted in the study, "PV power can generate electricity at much lower costs at all sites studied, which are located in regions with high solar radiation. Where biomass and/or wind resources can be utilised, the average generation costs may be even lower."

## Observations and comments

The study is comprehensive and points out that off-grid areas are complex and heterogeneous in nature. It shows some of the realities of providing energy solutions to off-grid areas. Its in-depth views and analysis are beneficial to policy makers as well as to developers and off-takers in off-grid areas.

Important issues highlighted in the study that are applicable to the Philippine scenario are noted below.

**FIT for renewable technologies** may be detrimental to installations in off-grid areas. Often, FIT rates are decided using the same methodology utilised for very large grid connected installations. If the off-takers or utility benchmarked the LCOE generated by small off-grid renewable plants to the FIT, they would deem the off-grid plant's LCOE very high. In the study, there is only one off-grid site where the FIT is higher than the LCOE from the hybrid solution.

**Some current power purchase agreements (PPAs) are inflexible.** PPAs that do not allow a change in technology are viewed as another roadblock as cited under Section 2.5, Selected Sites – Busuanga, Philippines. A quicker process of amending PPAs favouring renewable energy integration may be considered. Several restrictions may also exist with regard to foreign ownership in power or renewable energy projects in some countries like the Philippines.

**The lack of economies of scale and other technical difficulties are challenges off-grid renewable energy must face.** The study recommends the use of an automation tool and/or an integrated storage device (batteries) for continuous operation of small systems. However, it must be noted that these new technologies are not yet used in many parts of the developing world. These sophisticated technologies require operators who can handle the system properly. In off-grid areas, limited technical expertise exists to deal with complicated technologies. Moreover, for power developers to accept the technology, there should be a working model they can observe up close. The study needs to explain further how the automation tool works with the integrated storage device, what kind of technical expertise is needed for this application and where these solutions were used successfully. Sometimes other infrastructure, such as viable mobile and internet connections able to monitor renewable energy installations, is not available in off-grid areas.

**Energy growth is an important factor that should be considered for renewable energy solutions in off-grid areas.** The study assumes a constant energy demand and does not consider future growth of electricity demand. However, for areas with limited power supply, a new renewable energy installation should also take into consideration load growth and possible suppressed demand for the considered project life of 20 years because most off-grid areas rely on only one power generation source. The hybrid power plant should likewise take into consideration the provision of necessary back-up capacity to be able to supply reliable electricity continuously. Hybridisation should not be viewed simply as a replacement of diesel generation; rather, it should represent expanded service hours, load growth and extension of services to portions of the service area that are not yet connected. It would be unusual for the off-taker or electric utility not to consider the load growth in its forecast.

**One of the biggest challenges in off-grid areas is geography.** Most off-grid areas are far-flung or isolated. In choosing renewable energy, it is important to ensure that the area should have the desirable features for a renewable component, such as ample sunlight and available flat and unused land for solar solutions, good water resources for hydropower, correct quantity and speed of wind resource for wind technology, and availability of a sustainable source of fuel supply for biomass. The logistics of shipping the equipment and other materials to the site are also essential issues that must be dealt with. It is therefore important to note that the geographical feature of an area is a major item to consider in assessing the viability of renewable energy in off-grid areas. This is also a major reason why the smaller and easier to install diesel-generating set is the more convenient – but not necessarily the preferred – option.

## Conclusion

The study shows that there is a reduction in the LCOE and fuel savings with the integration of a renewable energy source in diesel mini-grids. It notes that “hybrid mini-grids that combine electricity generation from renewable energy sources with existing diesel generation have potential to reduce energy costs and boost energy security in a wide variety of situations”. Countries therefore that face the challenges of off-grid/island electrification should consider renewable energy hybridisation as a strategic option. However, these projects are usually more complex, and the limited sizes result in higher transaction costs. Specific analytical work, therefore, needs to be performed to properly determine the optimal configuration of projects based on the mixes of renewable energy resources available.

A potential deficiency in the availability of or familiarity with technology and sufficient up-to-date information on potential loads and costs are challenges that developers must face. Depending on the scenario, these projects may be carried out by government or implemented by the private sector. Attracting the private sector to off-grid areas, however, will require concerted governmental effort. As the study shows, “if hybridisation is financed by the private sector through an independent power producer, the Power Purchase Agreement needs to compensate for higher financing costs that result from a mix of real and perceived risks of investing in power plants in developing countries.” Thus, government must be able to develop the right mix of regulatory framework and incentives to make investments in off-grid areas attractive to the private sector. In this regard, ease of market entry is as important to the private sector as monetary rewards.

What is ultimately important is that in implementing hybrid mini-grids, the reduction of LCOE be sustainable and significant enough to promote equity, countryside growth and development, and to redound to uplift the lives of people in remote areas.

## 2.3. TECHNICAL-ECONOMIC ANALYSIS OF THE INTEGRATION OF RENEWABLE ENERGIES IN THE POWER SUPPLY SYSTEM IN SAN VICENTE, PALAWAN

Published by Deutsche Gesellschaft Für Internationale Zusammenabeit (GIZ) GMBH (2014).

### Summary

This case study was prepared to illustrate how power generation can be optimised using the renewable energy potential in an area and how appropriate business models with private-sector participation can be developed to integrate renewable energy in the local power supply system in San Vicente, Palawan. The study used HOMER modelling software developed by the US National Renewable Energy Laboratory (NREL) for the simulation and evaluation of least-cost options for renewable energy-hybrid systems based on the Electrification Full Service Scenario of the DOE.

The municipality of San Vicente, Palawan has ten barangays, five of which are already connected to the local distribution grid and five that are not. The SPUG supplies power using diesel generators in Barangay Poblacion while the Palawan Electric Cooperative distributes the power through a mini-grid. The power plant has three diesel generators with total dependable capacities of 740 kW serving a peak load of 500 kW. Daily operating hours are limited to 16 hours, from 8 a.m. to midnight.[15] The true cost of generation rate is PHP 31.0995 (USD 0.628) but the Palawan Electric Cooperative only charges consumers the subsidised/approved generation rate or of PHP 6.8596. The difference between the true cost of generation rate and the subsidised approved generation rate is then given as a subsidy, sourced from the Universal Charge for Missionary Electrification fund.[16]

In areas not yet connected to the grid, only 37% of households have limited access to electricity, either by self-generation or through privately owned diesel generators that supply electricity to their neighbours. Consumers pay as much as PHP 300 per month for a single 13-watt bulb for four hours a day or a price equivalent to PHP 180/kWh.

According to the study, the most suitable RETs that may be used in both connected and non-connected areas are solar PV and mini-hydropower. The HOMER simulations performed for grid-connected areas show positive results as follows:

- Total investments in renewable energy-hybridisation of PHP 503 million (USD 10.1 million) over the next ten years will reduce the true cost of generation rate by up to 40% compared with a diesel-only system.
- Savings of PHP 876 million (USD 17.7 million) on power generation cost can be achieved.
- Reduction of PHP 1.38 billion (USD 27.8 million) in subsidies from the Universal Charge for Missionary Electrification fund can be realised.
- Fuel savings of 19 million litres may result in the offset of 32,000 tonnes of $CO_2$ equivalent over the first ten years of operation.

Finally, the case study confirms that private-sector participation in the development of renewable energy in the local distribution grid is possible by means of establishing a new power provider, which usually must be selected through a competitive selection process.

[15] *Per the SPUG Grid Stat report, as of 23 December 2014, the island served 24 hours per day with the additional capacity of 1,223 kW and a dependable capacity of 990 kW.*

[16] *The Universal Charge for Missionary Electrification is collected from all electricity users in the country through their electricity bills.*

## Observations and comments

The study is comprehensive and presents a clear example of the type of analysis and project development process needed to determine the least-cost renewable energy hybrid option for any area. The following are observations and comments on the study.

**Establishing the demand forecast is a concern.** The study considered 90% household electrification as targeted by the DOE, although five of the barangays are not connected. At the same time, there were potential loads from a hospital, an airport, and some tourism projects (still in the pipeline) that were excluded from the forecast. No demand data were available for a 24-hour service scenario.

**Accessibility and connectivity to the local grid were major considerations in the prioritisation of potential renewable energy in San Vicente.** Two hydro sites of 100 kW each, which are closer to the existing plant, are being recommended together with the installation of 400 kilowatt-peak (kWp) of PV. The study suggests splitting the system into a number of installations distributed over the grid-connected areas of San Vicente to minimise potential outages. This may be practical only if no storage batteries are involved. Considering the intermittency of PV systems as well as the seasonality of the mini-hydro project, there is a need to conduct a grid-impact study and to comply with the small grid guidelines to ensure safe, reliable and efficient operation of the grid.

**Two possible models can be used for private-sector participation: the new power provider model or the QTP model.** Of the two, the study selected the new power provider as the means for the private sector to provide an integrated renewable energy-hybrid power supply for distribution by the Palawan Electric Cooperative through its local grid. It did not mention that they may also decide to create a subsidiary entity to take over both the SPUG operations and their distribution function in the area. In this case, the subsidiary then becomes a QTP and not a new power provider.

**Market entry in the connected area would be through a solicitation by Palawan Electric Cooperative or the NPC for a competitive selection process or via a joint venture.** However, when no competitive selection process is launched and Palawan Electric Cooperative is not interested in establishing a joint venture, the only way to establish a new power provider for the introduction of renewable energy is through an unsolicited proposal, which must be qualified by means of the Swiss challenge approach.[17] The DOE circular on new power provider/QTP contains no reference to the Swiss challenge. However, common practice somehow allows this.

**The study highlights the overlapping roles of various agencies in off-grid electrification.** It points out that the SPUG takes the lead role in overseeing and implementing the missionary electrification programme. This role must be clarified, however, against the roles of the DOE, which oversees preparing the Missionary Electrification Development Plan and performs the selection of QTP, and the NEA and electric cooperatives, which are mandated to achieve total electrification on an area coverage basis, as well as that of the ERC. While the SPUG is the sole agency that can access the Universal Charge, the decision on how much a new power provider or a QTP can draw from the Universal Charge for Missionary Electrification fund is a function of the ERC.

[17] *The Swiss challenge approach refers to a process in public procurement in which a public authority that has received an unsolicited bid for a project publishes the non-financial details of the bid and invites third parties to match or exceed it. The initial bidder is given the opportunity to match any superior bid that may be raised through this process (Government of Karnataka, 2010).*

**The study also highlights the misconception that the Universal Charge for Missionary Electrification was created to reduce subsidies.** The Universal Charge for Missionary Electrification was not meant to reduce subsidies but rather to provide subsidies to buy down the cost of delivering power to missionary (unviable) areas and guarantee recovery of private-sector investments in these unviable areas through the Universal Charge for Missionary Electrification.

**Some issues regarding bidding for takeover of SPUG generation in the off-grid also need clarification.** The DU/electric cooperative selects the power provider in SPUG areas. DUs and electric cooperatives have the option to become a supplier or a third party. Therefore, the electric cooperatives have the right to decide whether they will generate their own power in the off-grid areas via a subsidiary or joint venture or give up such function to a QTP or new power provider. Following this logic, the DU/electric cooperative should not be expected to bid for power generation that it will contract to its subsidiary or joint venture company. However, the Implementing Rules and Regulations of Republic Act 10531 specifies that DU/electric cooperatives have the first priority in bidding for SPUG operations.

**An absence of next steps to implement findings of the study exists.** The study recommends the performance of full feasibility studies to confirm its findings but did not highlight who among the players should implement the projects.

### Conclusions

The following conclusions are drawn from the study:

- The hybridisation of diesel power plants with renewable energy were found to yield positive results.
- The private sector can invest in the projects using either the new power provider or QTP model.
- There are, however, some institutional and regulatory issues that will require adjustments or amendments to facilitate private-sector participation. These include clarifying agencies' roles, streamlining a competitive selection process (and the exemption of electric cooperatives from such a process if they were to generate power on their own via a subsidiary or joint venture) and rate setting.

## 2.4. RENEWABLE ENERGY FOR MISSIONARY ELECTRIFICATION IN THE PHILIPPINES

A Final Report by Innovation Energie Developpement (IED, 2011), 12 December 2011.

### Summary

The objective is to examine the potential of using renewable energy in the missionary areas, either solo or in a hybrid system. It discusses existing legal framework (and associated policy and regulatory issuances) and points out gaps and required actions to accelerate the application of the suitable options, such as: (i) installation of RETs that are fed into the distribution system/grid of the DUs in missionary areas, (ii) standalone solar home systems and (iii) retrofitting of the SPUG's diesel plants with renewable energy components, thus establishing hybrid systems such as wind or solar/diesel systems. The study, moreover, presents possible business models, such as new power providers, QTPs and output-based aid. The latter, implemented through electric cooperatives, is considered the preferred option.

The IED report confirms the abundance of renewable energy resources in the off-grid areas as well as their potential for use in isolated mini-grid systems. The solar PV system is the only viable and most convenient electrification option for far-flung areas with dispersed populations.

Whether for single household or communal use, solar home systems provide pre-grid electrification pending extension of the electric cooperative's distribution system. For extremely isolated areas where line extension is not feasible, solar home systems are deemed "the only supply solution from the viewpoint of minimising subsidies and affordability". However, sustaining this mode of electrification is challenged by its limited battery life, system ownership and monthly payments.

The study also examines the potential integration of RETs in existing SPUG diesel power plants, which will lower fuel and maintenance costs and comply with the Electric Power Industry Reform Act mandate on the use of renewable energy.[18] The option for the SPUG is to retrofit existing power plants to make the gensets compatible with the integration of RETs. These could be solar/diesel, biomass/diesel or wind/diesel hybrid plants. Solar power, however, may only be considered baseload if it is fitted with battery storage. The biomass plant can be dispatched as baseload and the diesel plant can be operated only as a peaking plant.

## Observations and comments

The IED study confirms the integration potential of renewable energy in missionary electrification, both as an independent and a hybrid system. However, there are several considerations that must be addressed to optimise its use.

**Technology considerations.** The study says that the type of RET adopted will depend on: (i) the availability of the renewable energy resource, (ii) the compatibility of the resource for hybridisation of existing SPUG diesel power plants, (iii) the existence of other necessary physical resources such as tracks of land for solar PV and feed stock for biomass plant or gasifier engines, (iv) the location, demography and paying capacity of consumers and (v) long-term electrification service requirement of the area.

Logistics for biomass power plants are a challenge, but the same could also create new income and livelihood opportunities, *i.e.* in the gathering, collection and delivery of biomass for people in off-grid areas. New multi-fuel biomass technologies should be considered, as these are more flexible and robust in application.

**Commercial considerations.** The study points out that the SPUG is constrained from making capital investments or contracting loans and other financial obligations necessary in retrofitting existing diesel power plants. Hence the option is to privatise these plants. Unfortunately, the competitive selection process for private-sector participation mandated by the DOE did not make any significant headway because the electric cooperatives are not being incentivised, enjoined or capacitated to undertake this process. As the owner of the power plants, it would follow that the SPUG could take the radical step of and initiative in privatising these assets as mandated by Electric Power Industry Reform Act.

In areas not yet served by the SPUG, private-sector participation may be through a third party or by the electric cooperative itself or its subsidiary/affiliate. The electric cooperative may also enter into a joint venture agreement with a private investor. For a sustainable solar system deployment, the PV mainstreaming fee-for-service model is believed to be ideal for dispersed households. The cooperatives or third parties are the expected key players to provide solar PVs and ancillaries, the maintenance and the billing/collection in a sustainable way. The ERC, however, must approve the pending tariff application to allow subsidies for upfront capital

[18] *Implementing Rules and Regulations of Republic Act No. 9136, Rule 13, Section 3(c) states, "Whenever feasible, SPUG shall utilise Renewable Energy Resources".*

requirements (cost of the PVs and ancillaries) to enhance affordability and attract private investment.

**Policy and regulatory considerations.** The renewable energy law provides sufficient fiscal and non-fiscal incentives for renewable energy developers. Some of these incentives, such as the FIT, Renewable Portfolio Standards and net-metering, are already in place in the main grid. In the off-grid, the rules on cash incentives for renewable energy developers have been approved. The NREB and the DOE should expedite the issuance of the Renewable Portfolio Standards for off-grid areas to compel utilisation of renewable energy by off-grid operators.

According to the study, streamlining and simplifying the administrative processes in registration and qualification of a renewable energy developer or QTP will accelerate the use of renewable energy as well as achieve electrification goals. The processing of incentives and subsidies for missionary electrification should also be enhanced and made more expeditious. In a previous policy paper on missionary electrification, the IED recommended that a law be passed allowing new power providers and QTPs to file their own applications for Universal Charge for Missionary Electrification and allow the Power Sector Assets and Liabilities Corporation (PSALM) to directly pay new power providers and QTPs. This procedure is the same as that for cash incentives for renewable energy in off-grid areas, wherein developers may access funds directly from PSALM. However, the study team believes the designation of the SPUG as Universal Charge for Missionary Electrification petitioner and disburser is not specified in the law. Therefore, there is no need for new legislation to affect these changes. Only amendments on the pertinent circular by the DOE and resolution by ERC are needed for this purpose.

**Information campaign.** The study states that one of the reasons for the slow progress in renewable energy promotion and utilisation is the lack of information regarding renewable energy resources, technology and business models. The DOE and the NEA should take a proactive stance in creating and disseminating an information kit. The DOE should also establish and maintain an updated database of renewable energy resources to include a GIS map. The NEA should likewise develop a GIS of electric cooperative franchise areas showing grid and off-grid served and unserved areas. It would also be appropriate to make planning tools available to facilitate the electrification of unserved areas using the most appropriate, expedient and cost-effective technology. The Philippines' extensive experience implementing renewable energy projects should be documented in a systematic manner for the country to contribute to the body of knowledge on renewable energy development.

## Conclusions

The following conclusions may be drawn from the study:

- Specific RETs are available for implementation of off-grid electrification depending on the characteristics of the areas.
- The SPUG should initiate bidding to privatise its assets.
- Amendments to regulatory and administrative procedures in order to clarify, streamline and simplify are necessary to incentivise electric cooperatives, new power providers and QTPs to invest in off-grid electrification.
- Efforts should be exerted to improve information and develop planning tools to promote the use of renewable energy in off-grid electrification.

## 2.5. ASSESSMENT STUDY OPTIONS FOR A SUSTAINABLE FUTURE: PHILIPPINE RURAL ELECTRIFICATION SUPPORT PROJECT – MASBATE

A Final Report by Innovation Energie Developpement (IED), December 2013.

### Summary

This study was commissioned to evaluate the implementation of the PRES Project and investigate the problems that beset its implementation – particularly the technical, financial and regulatory hurdles and issues encountered – with the aim of finding solutions.

The main objective of the PRES is to provide power to remote and/or off-grid areas in Masbate, through solar home systems and/or mini-grid diesel installations. The project is a cooperation between public and private organisations. The DOE, through the NPC, implemented the project and designated a consortium, Paris-Manila Technology Corporation and ETDE T&D International, for the engineering, procurement, sales and construction contract. The total project cost was EUR 17.5 million (USD 18.5 million) with financial support from the French government through a loan and export credits.

The project, completed on 30 December 2009, saw 17,312 households electrified by 5,129 solar installations and 12,183 mini-grid installations.

The PRES Project, although specific to Masbate, is representative of remote and off-grid areas in the country. The study highlights the different challenges and risks that must be considered when entering remote and off-grid areas. The project is an interesting case study, as it takes into consideration the perspective of both a private project developer and public stakeholders and regulators.

### Observations and comments

The report shows that the PRES Project is aimed at providing power to remote and/or off-grid areas through solar home systems and diesel installations. However, there were significant gaps in the implementation that led to project unsustainability. Some early warning signs are listed below.

**Inadequate community/stakeholders preparation and lack of transparency.** The local government unit, as well as project recipients, were not properly informed or prepared to take on their roles and responsibilities as project recipients. Specifically, the recipients were not briefed that service would not be continuous. Moreover, people were not informed about payment terms or the need to be trained to maintain the PV systems.

**Absence of policy and regulatory framework in off-grid areas.**[19] The project planners intended for one party to install, operate and maintain the project. Hence, when the project components were installed, the system provider was meant to be both project operator and provider of operation and maintenance. But this was not to be the case. Because the policy and regulatory framework under the Electric Power Industry Reform Act was not yet in place, the institutional set-up of the project was not clearly defined.

**No designated qualified operator and operation and maintenance provider.** To fill the void, the SPUG was assigned as a temporary operator and operation and maintenance provider. This was perceived as rushing the project without sufficient preparation and business planning. The report notes that the equipment provided was of good quality and designed uniformly, in order to minimise operation and maintenance costs because of uniform spare parts. However, the more important aspect of the project, sustainability of operations by a qualified operator, was sadly neglected.

[19] *The PRES Project was conceptualised and planned immediately after the passage of Electric Power Industry Reform Act. At the time, the IRR were not yet in place.*

**Difficulty in getting private entity to take over.** Even after the formulation of rules for the entry of a private entity to take over the operation of the project, the circumstances did not change. The framework is considered stringent with many hurdles that discourage entry, rather than encourage the private sector to enter in these areas. Thus, until the present time, the SPUG continues to operate the project for lack of private-sector interest in taking over the project.

For the PRES Project to attain sustainability, a private entity must take over SPUG operations to do the following, based on current rules:

- The private entity must have a full QTP license (*i.e.* to generate and distribute power as well as to collect the payments from their off-takers) rather than just being the operation and maintenance provider. This process should not make the same mistakes made earlier (*i.e.* the tariff should be readjusted to the correct range and approved by the ERC, and the people in the communities must be informed and educated properly, etc.).
- The private entity must be allowed to charge a rate that will allow it to: (i) cover its expenses, (ii) achieve a certain return approved by the ERC and (iii) pay off the existing debt. The change in tariff can be justified by requiring the QTP to invest additional CAPEX for the plant (solar home systems and diesel) and rehabilitation of distribution assets, and for upgrading of the system so that operation is enhanced to be continuous.
- It is important that the QTP should be able to make improvements to and provide a continuous power supply, as this is what the consumers expect. A sufficient power supply will enable people to start livelihood activities and generate more benefit from the project beyond basic comfort and education access.

However, if getting a full QTP is difficult, it may be faster to have an agreement in which the private entity enters first as the operations and maintenance provider (because it will just replace the NPC) and transition it into a full QTP after the debt is paid off.

## Conclusions

Many lessons may be learned from this project.

- **Project design and preparation.** Because the project was conceptualised prior to issuance of the policy and regulatory framework, several parameters were not considered, such as determining the full cost of recovery rate and institutional structures and knowing the roles of project implementers and players.
- **Community/stakeholder consultations, social preparation and buy-in.** The roles of the community, local government units, etc. should always be defined. Project implementers must make sure consumer expectations are managed.
- **Operation and maintenance and after sales services.** This must be localised as much as possible. Training for solar home system recipients and of local electricians, etc., is essential. The availability of repair shops and replacements, etc., must be ensured.
- **Continuance of PRES Project versus grid extension.** The project is a loan that must be repaid. Its continued operation is therefore necessary. However, the NEA is also aggressively moving for the extension of the grid in Masbate. It is giving grant funding to extend the distribution lines of Masbate Electric Cooperative to cover areas that may include areas already covered by the project. When this happens, the operation

of the PRES Project will be rendered unnecessary. The DOE must resolve this issue. Should the PRES Project be allowed to continue and grid extension held in abeyance until the loan is repaid, or should it be the other way around? Which agency should be responsible for the loan, and how will it be repaid? The DOE, the NPC and the NEA should jointly decide how to deal with this issue to avoid complications.

More than a decade since the Electric Power Industry Reform Act was passed, it looks like off-grid and remote areas still need much attention. This assessment shows the great necessity to review and amend the existing policy and regulatory framework to ease and speed up the process for private-sector investments in the off-grid. The transitioning of NPC-owned and -operated assets to private entities should be accelerated. However, the transition process should be a swift and comfortable one for both the NPC and its successor. The government must ensure that the shift benefits stakeholders and pursues inclusive growth for rural areas.

## 2.6. CONCLUSION

These studies have provided various valuable insights, summarised below.

- There is clear potential for the reduction of the LCOE and fuel reductions through the incorporation of renewable energy into diesel mini-grids. However, the lack of economies of scale and the complexity of these projects often result in high CAPEX. Specific analysis must be completed to ensure optimisation of projects.
- There is potential for private-sector participation; however, significant regulatory and administrative issues must be resolved, including the streamlining and simplification of processes.
- Improved access to information, technical guidance and widespread capacity building is necessary.
- With regard to project implementation, project design and preparation need to be improved. More time spent in this phase will greatly reduce time spent in project implementation. Engagement with community and local government stakeholders early in the process is key to project success, as is managing the expectations of consumers. On-going support following on from construction must be planned for and well implemented, including ensuring the recruitment and training of operators and the availability of tools and parts.
- A key issue raised is the potential conflict between mini-grid implementation and grid extension. Grid expansion to a mini-grid area before full amortisation of the project is a significant risk for developers and needs to be properly addressed through medium- to long-term strategic planning.

# 3. Focus group discussions

## 3.1. INTRODUCTION

As part of the study methodology, two focus group discussions were conducted. The purpose of these discussions was two-pronged: (i) to gather feedback from key sector players concerning policy, regulations, administrative procedures and implementation concerns that brought either positive or negative results to the use of renewable energy in off-grid electrification and (ii) to elicit stakeholders' opinions on appropriate solutions to prevailing conditions that hinder the adoption of renewable energy to electrify remote and off-grid areas.

To maximise discussions, participants were divided into two groups according to similarities in their operations as follows:

- Electric cooperatives and NGOs. This group is composed of non-profit-oriented organisations that are engaged in off-grid electrification as part of their mandate and intent to serve.
- Private sector. This group is composed of private-sector developers and investors as well as financial institutions interested in financing renewable energy for off-grid electrification.

The discussions were carried out in two rounds during which participants were given guide questions for discussion. The first round focused on the acceptability of renewable energy for off-grid electrification as well as issues on planning and use of renewable energy in micro- and mini-grids. The second round centred on the policy and regulatory frameworks for enabling renewable energy development, including hybridisation of diesel-based power plants with renewable energy in off-grid areas. Participants were asked to write their ideas in metacards and expound on these freely during discussions.

## 3.2. DISCUSSION TOPICS AND GUIDE QUESTIONS

The same set of discussion topics and guide questions were used in both discussions. The following are the questions asked in each focus group discussion:

### Round 1 discussion

#### Topics

- acceptability of renewable energy for off-grid electrification
- planning and utilisation of renewable energy in micro- and mini-grids.

#### Questions

- Would you consider using renewable energy options for micro-/mini-grids? If yes, how do you intend to integrate renewable energy into off-grid electrification? If no, why not?
- What are the challenges in planning for the integration of renewable energy options for micro- and mini-grids, *e.g.* technology, resource data, load assessment, technical capability?
- What are the challenges and constraints in financing of renewable energy projects in off-grid areas, *e.g.* availability of equity, loan financing?
- What are your proposed solutions?

### Round 2 discussion

#### Topic

- policy and regulatory frameworks for enabling renewable energy development/hybridisation in off-grid areas.

#### Questions

- What are the challenges and gaps in the policy framework for enabling renewable energy micro-/mini-grids, *e.g.* clarity of direction and effectiveness?
- What are the regulatory challenges, gaps and/or barriers to renewable energy development/integration in off-grid areas, *e.g.* tariffs, incentive schemes?
- What are the administrative challenges, gaps and/or barriers to implementation of renewable energy mini/micro grids, *e.g.* registration, permitting, subsidy/incentive releases?
- As a long-term approach, who should be the key players in the provision of off-grid electricity in the Philippines and why?
- What are your proposed solutions?

## 3.3. FOCUS GROUP DISCUSSION WITH ELECTRIC COOPERATIVES AND NON-GOVERNMENT ORGANISATIONS

17 September 2015, Luxent Hotel, Quezon City

### Highlights of Round 1 questions

#### Using renewable energy options for micro/mini grids and how to integrate renewable energy into off-grid electrification

The participants expressed the possibility of integrating RET such as solar, wind, hydro and hybrid systems into their systems. The electric cooperatives are receptive to the idea of undertaking renewable energy projects in their franchise areas, doing so either alone or in joint venture with private power providers. The participants believe that the participation of the local government units, People's Organisations and NGOs in integrating renewable energy development programs with livelihood and other community development programmes will help facilitate the use of renewable energy.

#### Challenges in planning for the integration of renewable energy options for micro- and mini-grids

The participants were able to identify technical, operational and financial challenges. On the technical aspect, the participants consider the lack of NRE resources assessment and RET data and feasibility studies on renewable energy development as major constraints. There are also no economic assessments that the participants could access.

The electric cooperatives admit to their lack of orientation towards and knowledge to identify RET options or to prepare technical and economic assessments. There is also a need to enhance their capacity to prepare energy demand forecasts and proxy models and to prepare a power/distribution system design appropriately for the integration of RET in existing systems. They, too, are worried about inaccurate load assessment and resulting line losses. The electric cooperatives are preoccupied with complying with the numerous reportorial requirements of the NEA, the ERC, and the DOE instead of requesting assistance concerning renewable energy planning. The NGOs, although operating in small remote communities, have not been recognised as a mainstream partner in off-grid electrification.

### Challenges and constraints in financing renewable energy projects in off-grid areas

The participants believe that to ensure reliability and sufficiency in off-grid operations, a hybrid system consisting of renewable energy with diesel-run generators needs to be installed, but that these are capital intensive and costly. This perception may stem from a lack of knowledge about renewable energy economics, as previously mentioned.

Both the electric cooperatives and NGOs expressed a lack of financial capacity to undertake renewable energy projects. The NEA, at the moment, has no financing programme that the electric cooperatives can access for the development of renewable energy projects. While there are banks willing to finance such projects, the electric cooperatives and NGOs lack sufficient equity and other eligibility requirements to access this financing. Off-takers such as consumers in remote and isolated areas have low capacity to pay, and do not meet the financing criteria of banks.

Moreover, NGOs are not institutionalised as off-grid electrification partners. As such they are not eligible for government incentives under existing policies, adding to the difficulty of securing funds for community-based renewable energy projects.

### Proposed solutions to issues raised in Round 1

As to the technical and financing challenges, the participants came up with the following solutions:

To accelerate the use of renewable energy in off-grid areas, the roll-out of the "renewable energy for renewable energy" resource database project of the DOE and NEA should be expedited. This system should also identify what particular renewable energy resource exists in an area and how it can be utilised. This should be reinforced with technical training of NEA engineers so that they become competent consultants of electric cooperatives and consequently develop the competency and skills of electric cooperatives on RET and project development. This should also be supported with an information, education and communication campaign on renewable energy to include seminars/workshops for electric cooperatives, decision makers and executives on the technology and the economics of renewable energy operation.

To facilitate the financing of renewable energy projects, the NEA should expand their loan facilities to include renewable energy projects and provide soft loans to cooperatives for the performance of feasibility studies and implementation of renewable energy projects. Alternatively, the NEA could provide a roster of financing institutions and assist electric cooperatives in accessing the facilities of these institutions. Electric cooperatives may take advantage of the local government unit's Guarantee Corporation programme to secure financing for these projects. The Corporation guarantees 80% of risks not covered by the bank at a minimum premium. Another option would be a direct application with a private bank to finance the renewable energy project based on the most favourable terms. Still another option is for the electric cooperatives to enter into a joint venture with a private investor or a QTP to address financing constraints.

The introduction of livelihood projects in remote areas would ensure revenue from renewable energy projects as well as improve the beneficiaries' capacity to pay, increase the demand and sustain renewable energy power plant operations in these areas. The mandatory participation of political leaders and local government units in the planning process would enable them to appreciate the need to help in the livelihood concerns in implementing renewable energy projects. Low-income beneficiaries should be encouraged to put up their own equity in the form of labour and thus promote a sense of ownership of the renewable energy project. In the case of community-based renewable energy systems, certain conventional regulations should be

waived, especially in target areas that have unique needs and features. These systems should be recognised as an "access to energy" delivery channel for the most remote and poorest areas, and should be enabled to access Universal Charge for Missionary Electrification funds and renewable energy incentives.

## Highlights of Round 2 questions

### Challenges and gaps in the policy framework (clarity of direction and effectiveness)

The participants observed that the IRR of pertinent laws such as the Electric Power Industry Reform Act and Renewable Energy Act are prone to several interpretations. There is also confusion with respect to the functions of the ERC and the DOE in forming rules and regulations. It is understood that the DOE is in charge of issuing IRR and policies. However, in instances wherein issues are brought before the ERC, the ERC decision becomes the rule, instead of the rule being the basis for the decision.

There is also confusion as to which rules and procedures should be followed in procuring the power provider, as no clear policy exists regarding the competitive selection process, Swiss challenge,[20] implementation of the Government Procurement Reform Act and Private-Public Partnership schemes. In the case of unsolicited proposals, it has not been established whether the Swiss challenge process is accepted. Most electric cooperatives do not have the capacity or expertise to deal with unsolicited proposals or how the Swiss challenge should be conducted.

The absence of the Renewable Portfolio Standards in the off-grid areas was identified as one reason for the lack of growth in renewable energy in rural Philippines. The industry has long awaited the issuance of the Renewable Portfolio Standards guidelines, which are expected to encourage the use of renewable energy in off-grid electrification, as mandated.

### Regulatory challenges, gaps and/or barriers, *e.g.* tariffs, incentive schemes

The participants had experienced delays in ERC approval of tariffs and expressed the idea that an "all-FIT" approach or the use of on-grid FIT rules for all renewable energy (to eliminate/reduce delays) is not applicable in off-grid areas. Although the ERC has issued the formula for determining the cash incentives for renewable energy developers in off-grid areas, questions remain about the interpretation of this formula by the electric cooperative.

The matter of the "priority dispatch" of renewable energy was also discussed in relation to the existing Power Supply Agreement and the tariff. In cases where the tariff under a Power Supply Agreement is lower than a renewable energy tariff, the priority dispatch of the renewable energy source would not be an economic dispatch of energy. Hence the matter of which should prevail needs to be addressed. It was pointed out, however, that the Renewable Energy Act has clearly specified that generation from renewable energy has priority dispatch.

The discussions also brought up issues on accessing duty-free importation and the DOE-endorsed value-added tax (VAT); such endorsements, however, are issued only for those with renewable energy service/operating contracts. Unfortunately, even small-scale renewable energy projects need to secure a renewable energy service contract in the same manner as large-scale projects.

There is no policy on the entry of a community-based NGO. Although the NGO may become a QTP, it has difficulty complying with the requirements for QTP registration and for getting a renewable energy service contract. Thus, while it provides power in remote areas, the NGO

[20] *The Swiss challenge approach refers to a process in public procurement in which a public authority that has received an unsolicited bid for a project publishes the non-financial details of the bid and invites third parties to match or exceed it. The initial bidder is given the opportunity to match any superior bid that may be raised through this process (Government of Karnataka, 2010).*

cannot access subsidies from the Universal Charge for Missionary Electrification, which would effectively lower the cost of electricity to local consumers.

### Administrative challenges, gaps and/or barriers, *e.g.* registration, permitting, subsidy/incentive release

The permitting process is a barrier to renewable energy development in remote areas considering that the time and effort in getting it is not commensurate to the returns from small-scale projects. The process of securing a renewable energy service contract is long and tedious, involves too many government agencies with no timetable for each approval process, and some requirements are even considered unnecessary. For example, in all cases, a National Commission on Indigenous Peoples (NCIP) permit is required even when the project is outside an indigenous area. These also prove too costly for non-profit entities.

### Key players in the provision of off-grid electricity in the Philippines and their roles

The participants perceived the following as key players and their roles in renewable energy development in off-grid areas:

- the DOE – for formulation and issuance of appropriate policies
- the NEA – for provision of technical and financial support to electric cooperatives
- the NPC – to provide power to missionary areas and as the supplier of last resort
- electric cooperatives – to provide electricity in their franchise areas
- political leaders and local government units – to provide direction in local development
- People's Organisations – as key stakeholders in off-grid areas
- NGOs – as partners in remote/off-grid electrification
- private investors/QTPs – as co-developers and investment partners.

### Proposed solutions to issues raised in Round 2

Regarding policy and regulatory issues, the Renewable Portfolio Standards documentation should be finalised and its issuance expedited such that every industry player, *i.e.* generator, distributor, supplier or grid operator, is required to procure a minimum percentage of its power supply from renewable energy per area as discussed in Section 1.4.

It is proposed that the government implement a uniform guideline or policy in the conduct of competitive selection processes for renewable energy mini- and micro-grids. This policy should consider both solicited and unsolicited proposals and thus include guidelines for conducting a Swiss challenge. The terms must also indicate that the power supplier should source a minimum requirement with renewable energy (at least to the extent prescribed in the Renewable Portfolio Standards).

Such a policy should also provide for a different mode of entry of community-based renewable energy systems as power providers in target areas of special needs and features. One example of such a model is ESCAP'S Pro-Poor Public-Private Partnership (5P) Approach, which ensures a role in decision making, as well as financial returns for community groups (IRENA, 2016b).

To reduce the tariff, a policy may be adopted to allow "up-fronting" of benefits and fiscal incentives and other credits to reduce power providers' initial capital expenditure.

Only one government regulatory body is necessary to handle renewable energy for mini- and micro-grids, to strictly monitor compliance with the mandate of Republic Act No. 9513, as well as to implement the rules in consonance with the essence of the law and not merely based on technicalities.

With regard to administrative issues, it would be advisable to assign a single point of contact for renewable energy application processing. This would simplify and shorten the permitting process. The requirements for small-scale renewable energy projects should be simplified, and where appropriate, exempted from securing regular permits. The NCIP certification requirement should be excluded in areas where no indigenous people lands are affected. The technical and financial requirement should also be reduced while still ensuring uncompromised quality of equipment or service. There is a need for standardised documents as well as quicker and more efficient processing. This could be achieved by a implementing a straightforward checklist process for mini-grid systems in off-grid areas.

As for the NEA's role in renewable energy deployment, it would be advantageous for the administration to issue clear guidelines on renewable energy integration in the electric cooperative planning process as well as to orient electric cooperatives on the new policies, regulations and technologies, especially renewable energy. It would also be valuable for the NEA to assist electric cooperatives in accessing renewable energy resource assessment and other data. Toward this goal, the implementation of a review of the NEA's training programmes, a prioritisation of capacitating electric cooperatives on the performance of the competitive selection process, the drafting of a Power Supply Agreement and the undertaking of power generation projects and operations would be beneficial. When it comes to projects initiated that will be operated by electric cooperative or electric cooperative subsidiaries, it is suggested that the competitive selection process no longer be required.

For the electrification of remote areas, NGOs undertaking renewable energy projects should be supported and given incentives. The DUs may provide transmission subsidies, while the local government units could provide financial support or any kind of benefit. Community-based renewable energy systems should be recognised as an "access to energy" delivery agent for the remotest and poorest areas and should be assisted in accessing Universal Charge for Missionary Electrification funds. A policy to encourage and support private investment under a joint venture or build-operate-transfer scheme in off-grid areas should also be issued.

## 3.4. FOCUS GROUP DISCUSSION WITH THE PRIVATE SECTOR

18 September 2015, Richmonde Hotel, Ortigas Center, Pasig City

### Results of Round 1 discussion

#### Using renewable energy options for micro-/mini-grids and how to integrate renewable energy into off-grid electrification

All the private-sector participants said they would consider using renewable energy options for micro-/mini-grids. However, they emphasised that governmental assistance was necessary for the private sector to reduce the risks involved, which include demand growth in off-grid areas, financing, regulatory approvals, insurance risk and inconsistent fuel supply for biomass.

The participants were also open to integrating renewable energy into off-grid electrification through biomass, solar, wind and hybrid technology.

#### Challenges in planning for the integration of renewable energy options for micro- and mini-grids

Private-sector participants view the lack of business management skills, technical management skills and project management skills as major barriers for off-grid developers. Without these skills, they perceived the risks to be high and projects unable to prosper or be sustainable. This lack of skills is further aggravated by the lack of business models that developers can use as reference points.

Another barrier is the non-availability of technology and the lack of technological support. Among the technical-related issues raised were: (i) lack of technical standards for renewable energy in mini-grids, (ii) no technical studies/models for mini-grids and mini-grid sizing, (iii) the lack of clear guidelines on the use of batteries in hybrids and (iv) uncertainty on developers' part about whether mini-grids can handle the variability of renewable energy.

For the private sector to develop renewable energy projects, reliable information must be available. It seems that available information is fragmented. There are various sources of information from government agencies as well as professional advisors and consultants, but there can be conflicting views and it is difficult to determine which are correct. Participants also point out that securing information on system and expansion plans is very difficult. There is also a lack of resource assessments to aid developers in understanding local resources to be harnessed and to penetrate the local environment. There is also no inventory of local renewable energy plant components or parts that they can use.

Biomass developers face feedstock challenges, such as cost and availability. It is for this reason biomass development has progressed more slowly than solar and wind. The sustainability of biomass is in the feedstock because the fuel fee is a make-or-break situation, and currently there is no fuel fee guarantee.

Policy and incentives for local production of renewable energy plant components and parts were also mentioned by participants as necessary for accelerating the use of renewable energy.

### Challenges and constraints in financing of renewable energy projects in off-grid areas, *e.g.* availability of equity, loan financing

Banking-sector participants openly discussed their concerns about financing renewable energy mini-grids, including the collection risks from DUs. They are unsure about the viability of electric cooperatives and the timely release of the Universal Charge for Missionary Electrification funds for QTPs.

The bank representatives gave assurances that they can provide loans if projects are viable, and in this regard, the tariff rate is important. But often, tariff approvals take a long time; hence, banks cannot hasten the release of loans. Factors to consider include direct cost (*i.e.* fuel for biomass, operation and maintenance), CAPEX and profit margin. Banks will always look at cash flow to ensure the sustainability of projects.

The bankers also said the guarantee requirements of banks take some time to complete. Security Bank considers the Loan Guarantee Fund as good collateral. There are also other forms of guarantees such as provisional collateral, receivables and Universal Charge for Missionary Electrification assignment, including the mechanics of payment of the subsidy.

### Proposed solutions to issues raised in Round 1

The participants suggested the adoption of the HOMER software for micro-grid and distributed generation power system design and optimisation as the common planning platform. The software is the preferred planning tool for off-grid renewable energy because it considers factors such as resources, size, logistics, etc.

To address the lack of information, it was suggested that an information dissemination and education programme be accelerated to enable stakeholders to understand renewable energy, its technology, its use and its benefits. It would be optimal for the DOE to set up a clearinghouse for government information to ensure that there is uniformity and credibility in the data released. The participants also suggested the formation of an assistance office to be financed from development funds to help developers in their information needs and other requirements.

Discussions revealed a lack of understanding among participants about the various government policies and guidelines and how these apply to their projects. It was therefore strongly suggested that the DOE support the holding of regular dialogues to address such concerns. A neutral association with representatives from relevant sectors could be established for this purpose.

On funding, the DOE suggests that developers should access funds from the signed European Union (EU) bilateral programme on renewable energy assistance. Implementation of this programme, however, is still being worked out.

Capacity building of the banking and private sectors for better technical, managerial and financial understanding of renewable energy projects is missing. This could be facilitated through the public sector or the international community.

The participants also cited the need to set up measures to mitigate default by distribution utilities and ensure DU credit worthiness. Measures to facilitate the approval of tariffs and timely approval and release of Universal Charge for Missionary Electrification funds should be put in place.

## Highlights of Round 2 discussion

### Challenges and gaps in the policy framework for enabling renewable energy micro-/mini-grids (clarity of direction and effectiveness)

The main observation by private participants about existing government policies was the lack of singularity of purpose and synergy. Although the government wants to accelerate renewable energy deployment, the policies do not achieve the purpose because they are inappropriately applied. A number of policies are applied to on-grid and off-grid projects even if they have different characteristics.

In addition, there appears to be a gap in the pricing policy. FIT rules are used as standard or benchmark for renewable energy in the off-grid, which is inappropriate because the cost of doing business and installation of projects in the off-grid are much higher compared to on-grid renewable energy. The pricing for biomass power should consider the feedstock cost, as the viability of biomass projects is highly dependent on this.

### Regulatory challenges, gaps and/or barriers to renewable energy development, integration in off-grid areas, *e.g.* tariffs, incentive schemes

According to some developers, QTPs that want to do business in remote sites find it difficult to access the Universal Charge for Missionary Electrification. Thus, they resort to doing small projects (below 200 kW) and charge consumers the full cost of power generation. At full cost recovery, the consumers in these off-grid areas end up paying more for the electricity than their on-grid counterpart.

Uncertainty regarding tariffs is a consequence of a lack of guidelines applicable for off-grid and RET. According to developers who are already doing off-grid electrification projects, the FIT is not a good indicator or benchmark for tariff in the off-grid. A FIT that applies to all islands is not acceptable.

Project developers said they needed more incentives for off-grid electrification, such as the relaxation of regulations as applied to the off-grid. The guidelines for other incentives under the Renewable Energy Act should also be facilitated.

***Administrative challenges, gaps, barriers to implementation of* renewable energy *mini- and micro-grids, e.g. registration, permitting, subsidy, incentive releases***

According to the participants, the permitting for QTPs and the application for renewable energy service contracts and the Biomass Renewable Energy Operating Contract is tedious. There is also duplication of documents and requirements from units within the DOE itself as well as other government agencies. Moreover, the permitting requirements are "on-grid biased", which has implications for costs. This does not take into consideration the higher cost of doing business as well as different characteristics of off-grid areas. For example, there is a requirement for a competitive selection process. But in many cases it is already very difficult to attract investors to the off-grid. To require a competitive selection process in the off-grid using the usual two failed biddings before negotiation takes a long time. Questions to consider include how the DOE and/or the NPC can manage the competitive selection timeline process, and who should oversee this process?

A number of participants believed that some agencies and their hired consultants have insufficient capacity to deal with small renewable energy projects. They also believed that personnel have the technical expertise to assess large on-grid projects, but are not adequately familiar with off-grid areas and their operating concerns.

The participants indicated that the DOE, as the policy-making body, has an important role to play in accelerating renewable energy development, particularly the off-grid. Establishing a policy to benchmark tariffs is within the Department's remit, not the ERC's. In addition, it would be appropriate for the DOE to establish the policies and incentives for local production of renewable energy plant components and parts.

The DUs are in the best position to develop solutions to energise off-grid areas within their franchise. They should be given incentives similar to those given to other renewable energy developers.

#### Proposed solutions to issues raised in Round 2

Following are several solutions proposed by the participants:

The DOE, together with the NREB, should spearhead the development of policies and not wait for cases to be raised to the ERC. The formulation of policies specific to off-grid areas should be given priority.

It was suggested that a separate regulatory board for renewable energy for off-grid application, or perhaps a special unit in the ERC specialising in renewable energy for off-grid areas, be established. The identification and appointment of a renewable energy champion in the ERC would also be valuable.

It was strongly suggested that the processing time for permits and applications for renewable energy service contracts and Biomass Renewable Energy Operating Contracts be shortened by avoiding duplication of permitting requirements among its units and other agencies. Suggestions included the removal of unnecessary requirements and the requirement for negotiations, such as with the NPC for Universal Charge for Missionary Electrification access, to be rather considered as a ministerial process.

There is also a need to change or revise the law to allow direct payment of Universal Charge for Missionary Electrification funds to developers in off-grid areas. This will assure that a renewable energy developer can collect the funds in a timely manner.

On tariff setting, it was suggested that the ERC develop a Commercial Modelling of Tariff in off-grid applications because currently, the conventional tariff-setting scheme is still being used. The benchmark tariff should have cost adjustments for site geography, size and technology, and technologies should also be allocated a differentiated tariff. The ERC should also establish its guidelines for making adjustments of the benchmark in certain off-grid projects. The benchmarking of tariffs for QTPs would allow for fast approval of subsidies. With the advent of renewable energy hybrid application, there is now a need to formulate tariffs for hybrid. A simplified tariff calculation should be developed and should consider the use of storage batteries.

The existing FIT should be revised to consider the cost of feedstock, especially in the case of biomass. It is necessary for a local biomass index to be developed and a FIT rate applicable for off-grid to be considered.

Developers and banks should know the base cost of each technology to determine how tariffs should be structured. According to the DOE, there is a base cost for solar but not for other RETs, as these are site specific.

It must be recognised that players in off-grid are small, and the bankability of small off-grid developers is different from that of on-grid developers. To accelerate entry into this area, the government may consider providing fixed cash incentives for off-grid developers. The methodology for determining these incentives would need further investigation.

# 4. Field visits

## 4.1. INTRODUCTION

As part of the study, field visits were conducted covering relevant project areas. The identification of the project sites was made according to the following criteria: the project areas should be spread over Luzon, Visayas and Mindanao; one project area should be operated by the private sector (either a QTP or a new power provider); one project area should be operated by an NGO; one project area should be operated by the SPUG; at least one project area should be located in an island; and at least one project area should be land-based.

Figure 4.1 Locations of sites visited


Table 4.1 shows the mini-grid areas visited. Based on the above-cited criteria, the following areas were selected:

Table 4.1 Field visit sites

| Mini-grid area | | Location | Characteristics |
|---|---|---|---|
| Green Island renewable energy Mini-grid | | Roxas, Palawan Province, Luzon | • Island mini-grid<br>• First renewable energy hybrid project<br>• Operated by community-based NGO |
| Rio Tuba Mini-grid | | Batarasa, Palawan Province, Luzon | • Land-based remote area<br>• First diesel mini-grid operated by a QTP<br>• Biomass gasifier being installed |
| Santo Niño Island Mini-grid | | Western Samar, Visayas | • Island mini-grid<br>• Diesel plant operated by the SPUG<br>• Power distribution by electric cooperative |
| Senator Ninoy Aquino Mini-grid | | Sultan Kudarat, Mindanao | • Land-based mini-grid<br>• Diesel plant operated by the SPUG<br>• Power distribution by electric cooperative |

## 4.2. GREEN ISLAND, MUNICIPALITY OF ROXAS, PALAWAN

### Project description

Green Island is a sitio of Barangay Tumarbong, Roxas, Palawan. The island sitio is located around 18 km off the coast of Roxas, Palawan. Fishing and seaweed farming are the common sources of livelihood in the area.

Table 4.2 Green Island, Palawan Energy Profile, 2015

| | |
|---|---|
| **Solar PV** | 2.8 kWp (12 panels of 240 wp) |
| **Battery Storage** | 2.5 kVA capacity; 48,000 kWh |
| **Wind** | 5 kW |
| **Biomass gasifier** | 33 kVA |
| **Distribution line** | Single phase |
| **Connected Households** | 50 of 480 (10%); other households are served by diesel genset operated by neighbours |
| **Operating hours** | 4 hours; 6-10 p.m. |
| **Peak load** | 9 kW |
| **Tariff** | 50 per kWh |
| **Project Cost** | PHP 9 million (USD 180,000) |
| Power Source: 25.5 kW RE Hybrid System Operated by Palawan Center for Appropriate Technology | |

A grant from the United States Agency for International Development (USAID) for the installation of a 25.5 kW renewable energy hybrid system, featuring a combination of solar PV, wind and biomass technologies (see project specifications in Energy Profile Table) was given through Solutions Using Renewable Energy, Inc., the system installer of the project.

Total project cost amounted to PHP 9 million (USD 180,000) with PHP 4 million (USD 80,000) funded by USAID, PHP 1 million (USD 20,000) from the local government unit and PHP 4 million as a contribution from Solutions Using Renewable Energy and the Palawan Center for Appropriate Technology, the local NGO that will own and operate the system. The project was inaugurated in February 2014. Originally, the project was designed to install solar PV and wind technologies only. However, because there was a need to generate income beyond revenues for household use, a biomass gasifier was added. The gasifier was principally intended to power an ice-making facility to support the island's fishing industry and a reverse osmosis desalination machine to provide for the potable water requirement of the island community.

### Observations

At the time of the visit, only the solar PV was operating. The 5 kW wind turbine had been toppled over by a typhoon and was rendered unoperational as its guy wires had corroded. Project operations, therefore, were limited to four hours a day (6 p.m. to 10 p.m.) due to the limited capacity of the battery storage. This meant the project was not meeting the expectation of the people of 24-hour-a-day service. The biomass gasifier could have provided baseload capacity and ensured longer hours of operation. However, while the biomass gasifier was fine, it was not running due to lack of biomass fuel; there is no biomass fuel available on the island. Wood chips are sourced from a lumberyard on the mainland. The cost of fuel therefore was high at PHP 1,500 (USD 30.29) per truck of 100-sack capacity, as biomass fuel has to be transported by boat from the mainland. The gasifier uses one sack of fuel per four hours of operation. Thus, a truckload of fuel is good for 25 hours of electricity only. Due to the lack of power supply, the icemaker had ceased operation; 2.4 kW of electricity is needed to operate the ice-making machine.

The project had been turned over for operation to the Palawan Center for Appropriate Technology. It provides electricity to only 50 of 480 households and a few streetlights. The consumers' tariff is high at PHP 50/kilowatt hour (kWh) but is lower than the PHP 96/kWh they used to pay when connected to the diesel genset. A family of seven pays PHP 300 to PHP 320/month for one light bulb, one television and one DVD player. Project recipients therefore are paying a much higher tariff for their electricity than the retail rate of about PHP 11/kWh being paid by consumers in mainland Palawan. According to the project operators, collection per month averages PHP 15,000 (USD 302.85). Of this amount, PHP 8,000 is spent on labour and about PHP 12,000 on fuel. The Palawan Center for Appropriate Technology's operation, therefore, is running on deficit. Under current regulatory framework, the centre can apply as a QTP so it can access Universal Charge for Missionary Electrification funds to recover its operational deficit. Likewise, it can apply for cash incentives for renewable energy generation in missionary/off-grid areas under the Renewable Energy Act. However, based on an interview with Laurence Padilla, executive director of the centre, this is not possible because they cannot afford to go through the tedious and stringent process of applying for QTP and renewable energy service contracts.

Prior to the implementation of the project, a 20 kW system was providing power to the community on an intermittent basis depending on the availability of diesel. Aside from the 50 households served by the renewable energy hybrid project, the rest of the community relies on the 20 kW genset. Another concern therefore is how to increase the capacity of the renewable energy-hybrid project in order to cater to the needs of all the 480 households on the island.

## Lessons from the Green Island field visit

- The design and installation of power systems in island areas must be climate resilient. As experienced, the salty air easily corroded the guy wires that led to the toppling of the wind turbine during a typhoon.
- When implementing such projects, a warranty from suppliers and insurance of the systems have to be assured. Without warranty or insurance, the NGO is left to take care of the re-installation and replacement of parts as well as the maintenance of the turbine. Battery replacement should be a major issue. The cost of maintenance and/or replacements must be considered in the tariff setting for the project.
- Biomass has an advantage over other RETs, as it can provide baseload power but, for biomass to work, fuel sustainability at reasonable costs must be assured. It is senseless to put up a gasifier system when there is no supply of biomass. It is suggested that the Palawan Center for Appropriate Technology resolve the fuel supply sustainability issue. This is an issue that should have been considered during the feasibility study.
- People in island communities, like Green Island, pay more for the use of electricity than their urban counterparts. This inequality is likely the result of higher developer's costs being passed down to consumers, specifically the inability, due to the rigorous process, to access cash and other incentives.
- The tedious and stringent process and requirements for registration prevent small developers like the Palawan Center for Appropriate Technology from accessing incentives they deserve. It is suggested that policies be reviewed and amended to give small developers easy access to incentives.

- Productive loads such as water desalination and ice making are necessary for sustainability. The design and capacity of the renewable energy hybrid system should include the power requirements of productive uses.
- Only 50 households are benefiting from the project; efforts must be exerted to expand capacity to provide 24-hour service that will cater to all households on the island. Interventions by government or donor organisations could improve existing conditions, *i.e.* increase capacity and expand services to benefit all.
- The project was developed without the involvement of the Palawan Electric Cooperative. The project therefore does not fall within the framework for off-grid electrification established by the DOE. The project is more like a privately owned power system. Even if this is a donor-funded project, the Palawan Center for Appropriate Technology should be assisted in following existing guidelines and formalising its operations by undergoing the QTP, renewable energy service contract registration and the ERC approval process. The regulatory difficulties cited by the Palawan Center for Appropriate Technology highlight the need to revise existing guidelines to make them more responsive to small power applications, such as that of Green Island.

## 4.3. RIO TUBA, MUNICIPALITY OF BATARAZA, PALAWAN

### Project description

Rio Tuba is the first off-grid power facility managed and operated by a QTP, PowerSource Philippines, Inc. The area is a mountainous region with poor roads and is often inaccessible during bad weather. PowerSource was attracted to the area due to its economic development prospects and close proximity to a mining concession.

In 2004, Palawan Electric Cooperative, the franchise holder, formally waived the area and in March 2005, the DOE issued a public notice declaring Rio Tuba as one of the 428 unviable barangays open for QTPs.

Table 4.3 Rio Tuba, Palawan Energy Profile, 2015

| | |
|---|---|
| **Diesel gensets** | 5 x 350 kW; 2 x 210 kW |
| **Biomass gasifier** | 50 kW; 70 kW genset |
| **Distribution line** | 9.6 circuit km; 3.44 km of 3-ph and 6.24 km of 1-ph |
| **Connected households** | 1,743 |
| **Operating hours** | 24/7 |
| **Peak load** | 563 kW |
| **System loss (%)** | 7.76 |
| **Tariff (PHP/kWh)** | Full cost recovery rate – 24.50/kWh and Subsidised Approved Retail Rate - 8.50/kWh |
| **Project cost (PHP)** | 25.5 Million (USD 514,000) |


The Rio Tuba project started when the regulatory and administrative framework was not yet in place: the QTP guidelines were still being refined and the mechanisms for accessing the Universal Charge for Missionary Electrification subsidy were still being developed. Despite this,

the project was considered the pilot for the QTP programme and was approved for operation even while PowerSource was still processing its QTP endorsement and ERC tariff approval. With support from the DOE, they commenced supply of electricity services on April 2005 on a 12-hour basis with a tariff of PHP 14.70/kWh,[21] increasing to 24-hour operation in October 2006. The Waiver Agreement and the QTP Service and Supply Contract given to PowerSource will expire in June 2020.

## Observations

PowerSource's project in Rio Tuba went beyond the provision of electricity service. It combined electrification with community development including transfer of technology and management capability. PowerSource established its Community Energizer Platform (CEP) model for the enhancement of local livelihood, increased productive uses of electricity and enhanced community income. The CEP consisted of cold storage and mini-ice plant modules, internet access, and communications modules, which were housed in 20-40 footer container vans. However, some of the facilities (water purifier, ice maker, communication modules) operated only for several years.

As early as 2005, PowerSource had already envisioned the inclusion of a renewable energy hybrid system to operate in the area. They considered using a biomass gasifier to run in hybrid with existing diesel generating units. However, technical problems arose in the course of implementing the biomass gasifier. The idea did not work as conceptualised and as a consequence, the project has not operated since. At present, technical as well as work adjustments are being carried out, such as procurement of a new 70 kW gas engine and expansion of its cooling pond, additional filters, scrubbers, demisters, etc., to increase heat output to the required 400-500°C so it may run continuously.

With the passage of the Renewable Energy Law, PowerSource applied for the Biomass Renewable Energy Operating Contract, which was approved on February 2015. As soon as the gasifier becomes operational, they will be eligible for the cash incentives sourced from the Universal Charge for Missionary Electrification. However, the sustainability of feedstock could become a major concern. Although PowerSource has already contracted its fuel source from a local coconut producer, dependence on coconut shells – which have other competitive uses – may drive feedstock prices beyond economic levels. The DOE's requirement for a ten-year fuel supply contract to get a Biomass Renewable Energy Operating Contract is not practical.

## Lessons from the Rio Tuba field visit

- Becoming a QTP entails going through a long process. It took PowerSource five years to get its ERC tariff approval: the DOE endorsement arrived in July 2008 and the ERC subsidy approval in April 2010. They incurred losses because of the long wait. This was partly due to the absence of an administrative and regulatory framework. In order to attract more private-sector players to participate in off-grid electrification, there should be less paperwork. PowerSource said that it would be too arduous for small-sized projects to go through the same process.
- QTP areas are usually small capacity projects. Hence, it should not take the DOE, the NPC, and the ERC extended periods to evaluate QTP investment proposals. Coming up with standard formats as well as categorisation of projects according to type, size and location, with less regulation for small-sized projects, may help facilitate registration processes.

[21] *Actual cost for 2005 was PHP 73.478/kWh during the initial months of operations. Due to the limited paying capacity of its consumers as well as the expectation of recovering from subsidy, PowerSource initially set its tariff at rates much lower than actual cost and thus operated at a significant loss.*

- Subsidies for remote/off-grid areas that have low consumption/revenue potential have significant impact on the sustainability of projects as well as the capacity of the private sector to expand services and accommodate demand growth. PowerSource incurred losses due to delayed approvals.
- Capacity-building information, education and communication for stakeholders is an important component of renewable energy development. Although PowerSource had the vision to hybridise its diesel-generating facility with renewable energy, there was lack of expertise regarding the technical design that would best fit its operation. Hence, the company wasted time and money on an improperly or poorly designed biomass gasifier.

## 4.4. SANTO NIÑO, WESTERN SAMAR

### Description

Santo Niño is a fifth-class municipality of the province of Western Samar. It has 13 barangays situated on two islands: Camandag Island with six barangays and Santo Niño Island with seven. Based on the 2010 census, Santo Niño has a population of 13,504 and a total area of 29.53 square kilometres (sq. km). The main economic activities are fishing and agriculture. The island is mountainous and completely covered with coconut trees. It has a circumferential road accessible by four-wheel vehicles. The road extends to approximately 70% of the island. There is a very good, naturally protected port on the northern coast of the island at the municipal seat of Ilo with a large cemented pier infrastructure area capable of servicing large fishing and passenger bancas.

Table 4.4 Santo Nino, Western Samar Energy Profile, 2015

| SITE 1. SERVING BARANGAY ILO, BASUD AND BARAS | |
|---|---|
| **Power source** | 1 unit Dale Perkins 163 kW 1,800 RPM Diesel Generator set (1998 model);<br>1 unit Cummins 120 kW 1,800 RPM Diesel Generator (currently non-operational) |
| **SAMELCO 1 distribution lines** | 13.2 kV transmission with step down to 220 V; Single- and 3-phase distribution network covering eight barangays on north half of island |
| **Operating hours** | 8 hours/day (4 p.m. – midnight) |
| **Peak demand** | Average 110 kW |
| SITE 2. TAKUT-BUENAVISTA MINI-GRID | |
| **Power source** | 1 unit Dale Perkins 125 kW 1,800 RPM Diesel Generator set |
| **SPUG-operated distribution system** | 13.2 kV transmission with step down to 220 V; Single- and three-phase distribution network covering Barangay Buenavista and Takut |
| **Operating hours** | 8 hours/day (4 p.m. – midnight) |
| **Peak demand** | Average 53 kW; off-peak at 30 kW |
| **Tariff for both sites (PHP/kWh)** | PHP 6.5/kWh (subsidised generation); PHP 11.6/kWh (residential delivered) |
| Power supplied by the SPUG and delivered by SAMELCO 1 in the Barangay of Ilo, Basud and Baras; SPUG-operated mini-grids in Bgys. Takut and Ilijan | |

The town is covered by the franchise of Samar Electric Cooperative 1 (SAMELCO 1). There are three systems in Santo Niño: one off-grid system with transmission and distribution lines owned by SAMELCO in the Barangay of Basud, Ilo, and Baras and a diesel power plant owned and operated by the SPUG; one mini-grid system (transmission and distribution lines and diesel power plant) owned and operated by the SPUG servicing the barangays of Takut and Buenavista; and another SPUG mini-grid system servicing the barangays of Cabungaan and Ilijan. The SPUG's three power plants are located in the barangays of Ilo, Tacut and Ilijan.

## Observations

All three SPUG power plants operate eight hours (4 p.m. to midnight) per day. One unit, Dale Perkins of 163 kW capacity, was the only unit running during the time of the field visit. The unit consumes 230 litres of diesel on an eight-hour shift. Peak load averages 110 kW between 7 p.m. and 8 p.m. Barangay Ilo, being the seat of municipal government, has the economic edge over other barangays. There is persistent demand for a 24-hour electricity service, but the SPUG currently has no plans to expand its operations due to the high cost of fuel. The delivered cost of diesel in Calbayog City is PHP 38—PHP 40/litre. This cost increases when delivered to the island. Considering that consumers pay a subsidised rate of PHP 6.4447/kWh, the SPUG tariff is heavily subsidised from Universal Charge for Missionary Electrification funds.

The SPUG-managed mini-grids in Tacut are supplied power through a 125 kW Dale Perkins generator operated on an eight-hour shift from 4 p.m. to midnight. About 400 households are served. Peak load averages 53 kW between 7 p.m. and 8 p.m. This shows that the 125 kW generator is underutilised with capacity loading of less than 50%. While there is potential to interconnect Tacut and Ilijan, the anticipated additional connections are not seen to drive further demand. Even with expanded operating hours (12 hours as demanded by consumers), the demand and energy levels are not seen to significantly increase. Hence, the operation in these areas will remain heavily subsidised.

The six barangays located on the island of Camandag do not have power supply. Some of the residents use their own portable generators. Despite the lack of power generation facilities, SAMELCO constructed a 13.2 kV three-phase transmission and distribution network that nearly circles the island (only about 15% has not been covered), making a near-circumferential circuit. About 3 x 15 kVA transformers were installed for step-down power to household levels, but these could not be energised due to a lack of power supply. SAMELCO 1 plans to bring in and operate a diesel generator within the next four to six months for initial service of four to six hours per day. With an initial low demand of 200 kW, the island is a suitable candidate for a QTP. SAMELCO 1 could solicit an interested QTP or new power provider investor (or act in this capacity themselves) and pursue the formal regulatory status and subsidies associated with the QTP/new power provider programmes. It could also qualify the island as a renewable energy site by obtaining a renewable energy service contract, thereby enabling expanded service at tariffs subsidised by the Universal Charge for Missionary Electrification and renewable energy regimes.

## Renewable energy potential

The northern Santo Niño site in Barangay Ilo, where the power plant is located, has limited available open space for any large ground-mounted PV arrays, although there are ample south-facing roof tops that might accommodate a number of PV capacity installations. Also, certain public buildings and areas may be suitable for rooftop or low-rise ground-mounted small array sets. Household-mounted distributed arrays with bi-directional inverters may be possible too.

Coconut-related wastes are available in the area, as most of the agriculture is devoted to coconut plantation. However, there is a need to assess the sufficiency and sustainability of these biomass resources to support power generation. There is little open land suitable for planting

a fuel crop for biomass fuel/combustion unless intercropping amidst coconut groves is viable. High altitude central highlands offer interesting possibilities for small-scale, bi-directional wind towers, but there is a need for wind assessment to explore the viability of wind as a renewable energy resource.

As for water resources, the Libtong Falls/Libtong River, a small waterfall and stream, flows from the highlands passing right next to the SPUG plant. According to locals, the stream and falls have water year-round. There is a ten-meter deep pool at the foot of the falls that may be worth assessing for a pico- or micro-hydro plant. This could contribute a small amount of diesel displacement energy for the system.

### Lessons from the Santo Niño field visit

- The main issue confronting Santo Niño Island is how to viably extend service to 24 hours a day. There is a need to prepare a reliable load forecast to determine if the suppressed demand and possible new connections can justify the additional cost of service extension.
- It is necessary to determine if there is sufficient demand, and if so, to identify the most cost-effective service expansion solution. Considering the cost of diesel fuel and the risk of transporting fuel to the island, hybridisation of the existing diesel power plant with renewable energy should be given consideration. Aside from increasing capacity, hybridisation may also displace diesel usage.
- A solar (plus storage) integrated system option would allow for service hour extension without an associated automatic increase in operating expenses (*i.e.* no additional diesel fuel costs, no additional operators, no additional maintenance/overhaul costs associated with additional diesel genset operation and associated wear and tear). In effect, renewable energy allows for flexibility of operating hour increases and more time for demand to catch up with capacity installation.
- Undertaking a cost-benefit analysis is necessary to determine the best option for meeting the demand for electricity service. However, this is probably not within the capability of SAMELCO 1 and most DUs – and probably not even within the private sector, especially when one takes into account all the regulatory impacts and the fluid state of fossil fuel and renewable energy costs. Building such capacity to properly justify/evaluate the cost-benefit of use of renewable energy vs. fossil fuels/diesel will greatly increase the likelihood and speed of use of renewable energy in such off-grid mini-grid sites. The Asian Development Bank (ADB) has done a feasibility study of hybridising the diesel power facility of Santo Niño with solar and possibly a small-scale biomass gasifier. Said study should be reviewed by SAMELCO 1, the DOE, the NEA and the SPUG for possible implementation.
- The possibility of integrating the three SPUG power plants may also be considered to expand services to the entire island. If a biomass gasifier is proven sustainable, this could provide baseload power to the island with a solar dayload power source and the diesel gensets operating as a peaking facility.
- The installation of a distribution network in Camandag by the electric cooperative in the absence of any power supply is an example of the non-coordination among electrification agencies. This also highlights the difference in how agencies look at the concept of electrification. As cited in Chapter 1 of this report, to the NEA/electric cooperative, electrification is primarily line construction or extension. This is why distribution lines were constructed even without the power supply.

## 4.5. SENATOR NINOY AQUINO, SULTAN KUDARAT, MINDANAO

### Project description

Senator Ninoy Aquino (SNA) is an agricultural municipality located in the south-central portion of Sultan Kudarat province in Mindanao. The municipality produces various crops including rice, corn, coffee and vegetables. Its mountainous area is rich in copper, gold, chromium, zinc, silver and other metallic minerals.

Table 4.5 Senator Ninoy Aquino, Sultan Kudarat Energy Profile, 2015

| | |
|---|---|
| **Diesel gensets** | Installed capacity – 846 kW; Dependable capacity – 630 kW; 3 x 163 kW and 2 x 260 kW |
| **Connected households** | 4,176 consumers |
| **Operating hours** | 14 hours/day |
| **Peak load** | 567 kW |
| **System loss (%)** | 5.41 |
| **Tariff (PHP/kWh)** | PHP 4.7337/kWh (subsidised generation); PHP 7.9664/kWh (residential delivered) |
| Power supplied by the SPUG and delivered by SUKELCO | |

SNA is one of three municipalities within the franchise area of Sultan Kudarat Electric Cooperative (SUKELCO). This is not connected to the main grid. The two other municipalities are Palimbang and Kalamansig/Lebak. At SNA, the SPUG operates a diesel power plant with a combined installed capacity of 846 kW and dependable capacity of 630 kW. The power plant was upgraded to 14 hours/day in late 2015. With peak demand of 567 kW, the current reserved margin of 63 kW is very low. Energy purchased in September 2015 was at 123 MWh. As SUKELCO has vigorously been pursuing line extensions through the NEA-subsidised Sitio Electrification Program, a power supply deficiency is foreseen with additional household connections unless the SPUG augments its current generator sets. However, it is unlikely that they will do so, as the National Grid Corporation of the Philippines (NGCP) reportedly plans to interconnect these two separate mini-grids into the main Mindanao grid. A 69 kV transmission line will connect SNA with the municipality of Lebak and, when completed, SNA will graduate from being a mini-grid. However, it is not clear at this point if SPUG operations will cease as soon as the line connection happens and how current Universal Charge for Missionary Electrification subsidies will be handled when interconnection is completed.

### Observations

Of the 10 350 households in SNA, there were only 3,906 residential consumers served by the SUKELCO as of September 2015. This translates to only 39% household electrification. The electric cooperative is aggressively pursuing barangay and sitio electrification as distribution lines are being constructed even in mountainous areas with very isolated and dispersed houses. While line expansion is being pursued by the electric cooperative, the SPUG has not programmed any expansion of power supply generation. Moreover, while the increase in operating hours from 12 to 14 hours/day was scheduled to start in October 2015, there is also no plan for increasing the capacity of the existing power plant. As noted, the reserved margin was only about 60 kW.

According to the electric cooperative, the NGCP has already approved the construction of a 69 kV transmission line that will connect SNA with the Mindanao grid. When completed in three years, SNA and the two other areas, Palimbang and Kalamansig/Lebak, will then transition to micro-grids interconnected with the Mindanao grid. There is, however, no plan for the SPUG to pull out from these areas. When this happens, the privatisation of the three off-grid facilities

should be considered and their graduation from the Universal Charge for Missionary Electrification subsidies should be effected.

The SPUG's Missionary Electrification Plan has no plan for integrating renewable energy sources in its SNA diesel power plant. It is noted that there are several rivers and small waterfalls in the municipality, but resource assessment has not yet been conducted. There are also a number of known large water resources in the neighbouring municipality of Lebak, which the electric cooperative is very keen on developing, but the electric cooperative needs guidance on how a hydropower development project may be pursued.

### Learnings from SNA field visit

- The aggressive expansion of the SUKELCO distribution system under NEA's Sitio Electrification Program may lead to massive power shortages if the SPUG does not come up with additional capacity to meet the demand of additional household connections upon completion of the distribution lines. The electric cooperative, the DOE, the SPUG and the NEA should attend to this since the interconnection is still three years from now.
- The SNA situation highlights the issue of the need for a graduation policy from the Universal Charge for Missionary Electrification. SUKELCO has only three off-grid areas in Sultan Kudarat. These areas are currently being subsidised through the Universal Charge for Missionary Electrification. The rest of its franchise areas are connected to the grid and supplied power through the main grid. With the interconnection of the three areas to the main grid, SNA, Kalamansig/Lebak and Palimbang should be graduated from the Universal Charge for Missionary Electrification. The DOE and the SPUG should come up with the appropriate graduation policy guidelines to deal with this kind of situation. The SPUG may opt to transfer its facilities to other areas or to undertake a competitive selection process to transfer its facilities to the private sector.
- There are renewable energy resources in the area that the SPUG or the electric cooperative could tap to augment the existing power supply. The SPUG's Missionary Electrification Plan should consider renewable energy integration in the off-grid areas of SUKELCO.
- The electric cooperative is interested in developing its own hydropower plant but lacks knowledge and competence. This is an opportunity for the NEA to provide the necessary assistance through its Office of Renewable Energy Development.

# 5. Summary of findings and conclusions

The study team drew a number of conclusions consequent to the review of government policies, plans and programmes as well as the studies and reports prepared by international organisations. These were validated through the focus group discussions and field visits. This chapter presents these findings and conclusions.

The key findings are classified into five key categories:

1. Roles and responsibilities
2. Planning
3. Policy approach for mini-grids
4. Regulatory approach for mini-grid projects
5. Project development and execution support

## 5.1. ROLES AND RESPONSIBILITIES

### Key government agencies

There are three agencies directly involved in rural off-grid electrification: the NEA through the electric cooperatives, the SPUG and the DOE.

- **The NEA** supervises the electric cooperatives and finances line extensions to sitios, both on- and off-grid, where electric cooperatives distribute power.
- **The SPUG** generates power for remote, off-grid areas both on the main islands and on small isolated islands.
- **The DOE**, besides being the policy/planning body, is also implementing rural electrification by undertaking household electrification using solar PV home systems and micro-hydro systems either directly or through its implementing arm, such as the Affiliated Renewable Energy Centres (ARECs).[22] It is also in charge of declaring and soliciting QTPs for unviable areas. Moreover, the DOE is in the forefront of planning and implementation of the Household Electrification Development Plan and heads its implementing arm, the Household Unified Strategic Team.

Having three agencies pursuing rural electrification creates confusion as to which agency is ultimately responsible and accountable for rural electrification. This situation may be corrected when the NEA assumes its mandate under the National Electrification Administration Reform Act of 2013 as the agency in charge of preparing the country's Total Electrification Plan. While the NEA does not have direct authority over private investor-owned utilities and local government units, it can certainly coordinate with these entities by virtue of its mandate.

Based on the Missionary Electrification Development Plan, the SPUG is to privatise its operation in the off-grid, but still retain the Small A areas (those with gross generation above 50 MWh) while the even smaller ones, or the Small B areas (those with gross generation of 50 MWh and below) are to be offered to the private sector or QTPs. The commercial soundness of this strategy is uncertain because the smallest areas are the least attractive to private investment. This strategy is also inconsistent with the mandate that the SPUG is to be the provider of last resort. The current Missionary Electrification Development Plan also has not specified any plan regarding the electrification of small areas that the private sector or QTPs are not interested in serving.

[22] *ARECs are regional colleges and universities that have been accredited by the DOE as their affiliated institutions. The ARECs are mandated, among others, to implement projects and conduct research and studies in support of DOE programmes, as well as provide renewable energy technical assistance to private developers.*

The NEA's Sitio Electrification Program and the electric cooperatives cover only on-grid line extension. The use of mini-grids for off-grid electrification is not yet in the NEA's agenda, although recently, the NEA has appeared to be heading in this direction as it has supported pilot renewable energy mini-grid projects by electric cooperatives in collaboration with the ADB.

Remote and unviable areas had been pushed over to the DOE for electrification via solar home systems, solar kits or micro-hydro. The DOE's REMB considers these to be pre-grid electrification schemes. The DOE has also taken over the responsibility of bidding out so-called unviable areas for QTP electrification, albeit with only minimal success. While the move by the DOE to take charge is noteworthy, it seems to have effectively allowed franchise holders to freely relinquish their area-coverage obligations. The draft revision to the QTP guidelines is supposed to put this responsibility to choose QTPs in the hands of the electric cooperatives, but such revised guidelines have not been issued yet.

### The private sector, NGOs and other stakeholders

A clear understanding of RETs and their benefits to the local community will pave the way to stakeholder acceptance and engagement. Local NGOs have been active in bringing RETs, such as micro-hydro and solar PV electrification, to very remote areas, but their participation somehow has not been institutionalised. Some NGOs are skilled in community organising and training of local communities to implement renewable energy projects in a self-help manner. However, NGOs find it difficult to comply with the stringent organisational and financial standards set by government.

Local government units and NGOs have been filling some of the gaps where the electricity cooperatives and the SPUG have not been able to serve. Currently, local government units and NGOs are operating informally outside of the purview of the DOE/ERC. NGOs access their own funding and operate without any support from the DOE or NEA. NGOs generally help very small off-grid communities develop power systems such as micro-hydro and solar PV projects.

### Coordination

It has been observed that only the DOE, the NEA and the SPUG are collaborating towards the attainment of the government's electrification targets. However, other than providing power, the people's social and livelihood needs must also be addressed in order for electrification projects to be sustainable and for the inclusive growth agenda to be attained. Thus, there is a need for better coordination with local government units and other departments (such as the Department of Social Welfare and Development (DSWD), Department of Trade and Industry (DTI), etc.) in the planning and implementation of electrification targets. Moreover, coordination with agencies such as Department of Environment and Natural Resources (DENR), NCIP, National Water Resources Board (NWRB) and others is also needed to ensure fast action on renewable energy permitting/approval requirements from local government units and other agencies.

## 5.2. PLANNING

The Philippine Development Plan has one goal: inclusive growth. To this end, rural electrification is a key driver in bringing the benefits of the country's improved economy to all Filipinos. Thus far, the country's rural electrification programme is just 9.1% short of its target of 90% household electrification. However, the country's population continues to grow, and many of the remaining households are located on isolated islands or remote areas that are not reachable by the power grid. The findings from the review of the energy plans and programmes show some gaps in the current strategies employed as well as inconsistencies with the inclusive growth agenda of government.

The reforms in the energy sector introduced through the Electric Power Industry Reform Act and the National Electrification Administrative Reform Act of 2013 re-emphasised the national policy of total electrification. In the Electric Power Industry Reform Act, the electrification of remote and unviable areas was put into focus with the opening up of the rural electrification business to the private sector, either as QTPs or as new power providers, and the mandate for the creation of a universal charge to fund missionary electrification. The National Electrification Administrative Reform Act of 2013 reiterated this policy of the state to "promote the sustainable development of rural areas through rural electrification" and the NEA's mandate to pursue the government's electrification program "to bring electricity to the countryside, even in missionary and unviable areas through the electric cooperatives".

The national government, through its energy agencies – the DOE, the NEA, and NPC – has devised plans and programmes to implement this policy. A target of 90% household electrification was set by the DOE in September 2011. Beyond simple household lighting, however, accomplishing the goal of sustainable development of rural areas through rural electrification has not been easy to achieve. Bringing electricity to isolated islands and remote areas continues to be a challenge that the energy sector has to face. After a review of the policies as well as plans and programmes of the various energy agencies, several issues were found to be either inconsistent and/or constraints to this goal.

Under the National Electrification Administrative Reform Act 10531 of 2013, the NEA is mandated to prepare a Total Electrification Plan. But this is not yet in place. In the absence of the Total Electrification Plan, the DOE, the NEA and the SPUG have introduced their own discrete plans and programmes. With regard to missionary electrification, the Missionary Electrification Development Plan objectives are focused on reducing the Universal Charge for Missionary Electrification and improving the reliability of limited SPUG operations. There appears to be a gap in directing specific attention to the electrification of areas without access to electricity and to increasing service hours in areas with a less than 24-hour electricity supply.

### Terminologies in planning and programme implementation

Ambiguity in the terminologies may have caused the inconsistencies and confusion in the implementation strategies of different energy agencies. As observed in Chapter 1, there is a need to clarify the definitions and meaning of terminologies to ensure that all agencies have the same understanding and perspective of the policies and goals. Terminologies to clarify include:

**The concept of rural electrification and of energy access.** There is a need to distinctly define at which level rural electrification and energy access are attained; whether this is by simply the installation of a distribution system (electric poles and hardware) – meaning the wires are available but a household is not necessarily provided with an actual electrical connection – or actually having electricity at home.

**The concept of minimum service for energy access**. There is a need to define what energy access means and to specify the minimum level of service or hours that electricity is available for a household to be considered as having energy access. This concept must also be reconciled with the concept of rural electrification and the ultimate goal of inclusive growth.

**The interpretation of the term "missionary electrification".** While the IRR of Republic Act No. 9136 define missionary electrification as provision of electricity in the unviable areas, the ERC uses this term to include all off-grid areas (not connected to the national grid transmission system), such that even areas that are already considered economically viable (*e.g.* the main islands of Palawan and Mindoro) are still classified as missionary electrification areas. Hence, there is a need to clarify the policy as to whether the term "missionary" should be defined according to an area's connection to the country's main grid or to its economic viability.

**The concepts of mini-grid and micro-grid.** These are currently defined according to geographic service coverage, *i.e.* number of barangays served. However, this definition does not take into account the capacity of the system and the type of service being provided. There is a need to revisit the definition in light of its implication for the policy and administrative guidelines on rural/off-grid electrification and the government's programme on household electrification.

## 5.3. POLICY APPROACH FOR MINI-GRIDS

### Role of renewable energy in off-grid electrification

Despite the passage of the Renewable Energy Act, the role of renewable energy has not been fully institutionalised within the plans and programmes of agencies, particularly with respect to off-grid electrification. The National Renewable Energy Program issued by the DOE focuses only on targets for renewable energy on the main grid (DOE, 2011c). According to the Program, off-grid renewable energy targets are to be incorporated into the Missionary Electrification Development Plan. However, this document – as well as all other plans and programmes reviewed – has not successfully incorporated the policy on the use of renewable energy. Instead, renewable energy is regarded as the "preferred option." The Missionary Electrification Development Plan does not specify any programme or strategy for using renewable energy in remote, isolated or dispersed areas, contrary to what is expected under the National Renewable Energy Program. Specific targets for implementation of renewable energy in off-grid areas based on the Missionary Electrification Development Plan do not exist, and renewable energy is not declared to be a priority over diesel-based systems.

It is noted, however, that the SPUG's Missionary Electrification Plan includes a plan for hybridisation of some of its operated areas with solar PV. But considering the restrictions on the NPC's investment and contracting authorities, it is unclear how they might be able to carry out these plans.

### Tariff determination

Tariff determination for off-grid areas is unclear. At best, the tariff standard is also on-grid based. The ERC has indicated that it is using the FIT rates as a benchmark for approvals of tariff for off-grid renewable energy projects. This, however, fails to appreciate or place a premium on the complexity and difficulty factors that make off-grid systems costlier and riskier to develop.

## 5.4. REGULATORY APPROACH FOR MINI-GRID PROJECTS

With the deregulation of the Philippine electric power industry, a more competitive, market-based regulatory framework has been introduced, principally to encourage private-sector entry. The current regulatory framework has managed to bring more renewable energy players into the grid, as well as some islands with mini-grids (*e.g.* Mindoro, Catanduanes and Sibuyan Islands) in the last decade. However, this same regulatory framework and implementation of administrative procedures are also proving to be one of the major challenges for the use of renewable energy, particularly in mini- or micro-grids for rural and off-grid electrification.

Regulators must recognise that the market in the off-grid is different from that of the main grid. Various factors, such as a smaller market base, low capacity to pay, logistical complexities and locational hazards, make off-grid electrification unattractive to large companies. To attract smaller players, there is a need to improve ways of doing business to reduce transaction costs and facilitate project implementation, especially in areas left behind.

### Inefficient and unnecessary regulation and administration

Market entry is stringent, arduous and not conducive to attracting the private sector. The current regulatory and administrative processes are complex and hinder the entry of capital, especially in remote, off-grid areas. This sentiment was raised during the focus group discussions, particularly by small companies interested in becoming new power providers or

QTPs in off-grid areas, and even by electric cooperatives that desire to generate power for their off-grid franchise coverage. The documentary requirements plus the evaluation process within various DOE departments as well as the ERC result in delays. This is true for approvals of renewable energy service contracts and QTPs as well as tariffs. This translates to high administrative and compliance costs both in terms of time and money. For example, in the case of the renewable energy hybrid project in Sabang, Palawan, the request for approval of tariff was initiated in 2013 but not even a provisional approval had been issued at time of writing. This long gestation for tariff determination and approval negates the ERC guidelines, which provide that the ERC is to issue a provisional approval within 75 days of filing an application. The same issue is experienced in the case of receiving approval for renewable energy service contracts and authority to operate by QTPs.

In addition to the requirements and lengthy evaluation processes within the DOE, developers also must contend with the challenges of getting approvals from other government agencies. Aside from being tedious and costly, some of these requirements are also viewed as unnecessary, based on evidence gathered during the focus group discussions and field visits. In the case of the renewable energy service contract, for example, the oft-cited requirement is that of getting clearance from the NCIP, even for areas not occupied by indigenous people or outside ancestral domains. The implementation of the Energy Virtual One Shared System, a web-based monitoring system, is supposed to shorten the time it takes to obtain the necessary permits to start a renewable energy project.

Currently, the regulatory framework has a grid bias. The same set of regulatory standards and procedures are applied to all projects, both on-grid and off-grid, regardless of size, location or market condition. This on-grid bias fails to take into account the risks and difficulty factors of small-scale, off-grid projects and thus curtails private-sector interest and enthusiasm in serving the off-grid areas.

### Universal Charge for Missionary Electrification

The Universal Charge for Missionary Electrification was created to fund missionary electrification. However, due to the ERC's expanded definition of missionary electrification as referring to all areas not connected to the main transmission grid, both public and private operations in SPUG-covered areas have been receiving Universal Charge for Missionary Electrification subsidies.

No graduation policy for entitlement of funds from the Universal Charge for Missionary Electrification is in place. Thus, for example, despite the fact that power generation in mainland Palawan[23] is now fully privatised, power generators continue to access the funds. Consequently, a significant percentage of the fund is benefiting larger islands and more viable areas, where consumers are paying subsidised tariff rates, while consumers on smaller islands and remote areas are not covered and are paying higher, non-subsidised rates. This fosters inequity in the awarding of the funds. Since these relatively large off-grid areas are not likely to be interconnected to the main transmission grid, power generators in these areas will continue to receive the subsidies as long as no graduation policy is in place. Moreover, there is no incentive for these power generators to look for or to use more efficient and lower cost technologies, since they can continually use the subsidy to cover the full cost of their operations.

Pending the issuance of a graduation policy, the SPUG has filed an application for an increase in the subsidised/approved generation rate in line with the goal of the Missionary Electrification Development Plan on the reduction of dependence on the funds. But for lack of economic studies, they have based their application on the ERC-approved generation rate adjustment

[23] *Prior to the Electric Power Industry Reform Act, the main islands of Palawan and Mindoro were already being served by the SPUG with continuous electricity.*

mechanism and incremental currency exchange rate adjustment. This strategy, however, is a stopgap measure.

The high costs in terms of time, effort and capital acts to discourage small operators – the operators usually interested in off-grid areas – from considering going through the regulatory and administrative processes to access funds from the Universal Charge for Missionary Electrification. To avoid the process, small-scale operators such as QTPs opt for the quickest way: *i.e.* by limiting operations to small-scale systems (below 200 kW), or less than 100 connections. They do this because ERC rules allow them to charge such consumers their full cost recovery rate, provided they do not access a subsidy from the Universal Charge for Missionary Electrification Funds. This may be good for the investor, but surely is not for poor and marginalised consumers in remote communities, who end up paying higher tariffs and missing out on the benefits of the subsidies intended for them.

In the case of the electric cooperatives, the entitlement to Universal Charge for Missionary Electrification funds appears to be contentious. In the current interpretation as to who is entitled to the funds, there is a notion that because electric cooperatives are not "third parties", they are not entitled to the subsidies. However, as intended by the Electric Power Industry Reform Act, the Universal Charge for Missionary Electrification is to subsidise the cost of generating and distributing power in missionary or unviable areas. Thus, there is a need to clarify the policy on entitlement of Universal Charge for Missionary Electrification funds, *i.e.* that it should be based on the unviability of the areas to be energised and not on the type of organisation undertaking the electrification activities.

## 5.5. PROJECT DEVELOPMENT AND EXECUTION SUPPORT

### Viability issues of renewable energy for off-grid electrification

Large-scale developers and bankers view the off-grid electrification market as high risk and unattractive. During the focus group discussions, they were as one in saying that the local condition in the market for power in off-grid areas is a major factor that affects project viability.

- The off-grid market is normally characterised as small since demand for electricity comes mainly from household lighting requirements; there is limited demand from commercial users and in most areas, there are no industrial applications.
- Lack of power and limited livelihood opportunities affect the capacity of consumers to pay and inhibit economic progress.
- In many cases, there is a lack of information or credible data on which to base demand projections, making investment analysis difficult and less reliable. Bankers are specifically concerned about the off-take and revenue streams of projects that are up for financing.
- The costs of implementing off-grid projects are higher compared to on-grid projects because construction, delivery of supplies and logistics are more complicated.
- Among the deterrents to private-sector participation is the matter of the tariff. A lack of economies of scale means the rates require heavy subsidies from the Universal Charge for Missionary Electrification funds. The inability to access the subsidy entails a higher true cost charged to users who are hardly able to afford electricity.
- Finally, security concerns in some areas prevent the private sector from investing in areas that need electrification the most. Entry to these areas, even by government agencies, electric cooperatives and the SPUG, will require support from other government institutions such as local government units and the military.

## Financing

The financing concerns of investors and bankers regarding issues affecting renewable energy development for off-grid electrification stem from a number of factors that relate to both the market and regulatory risks.

The low potential for investment returns is further exacerbated by off-takers' lack of paying capacity, pricing and the indeterminate formula for tariff determination. The ERC's need for more review and evaluation personnel results in delays in tariff approvals. Other issues and concerns include delays in collection, a lack of assurance about Universal Charge for Missionary Electrification fund releases and inflexible Power Supply Agreements.

While the FIT is already implemented for on-grid renewable energy, developers believe that it is not applicable to off-grid areas due to the different conditions prevailing in each particular site and the specific application of the RET. The cost structure is likely to be different in off-grid areas compared with on-grid renewable energy, and even more so on small islands. This concern was raised particularly in the case of biomass technology, wherein the cost and reliability of feedstock supply are key to the sustainability of the project.

A need for business models that may be used as reference points exists. Of a handful of remote area off-grid renewables in operation, only one or two may be considered successful. While attempts have been made to prepare reference investment studies by international organisations – such as the one prepared by the GIZ for San Vicente, Palawan – these have not been implemented.

In the case of electric cooperatives, the lack of equity affects their capacity to invest in off-grid renewable energy since bankers consider the financial standing of electric cooperatives when making a decision to fund renewable energy projects. The use of joint venture vehicles for investments in off-grid renewable energy by electric cooperatives is viewed as one way to facilitate these investments and allow access to Universal Charge for Missionary Electrification subsidies by consumers in areas they would serve.

## Level of awareness

In the focus group discussions and during field visits, it was apparent that there is a low level of awareness among electric cooperatives, local government units, end-users and even project developers regarding RETs in general, and their use in off-grid areas in particular. This low level of knowledge is evident in the selection and design of RETs. Aside from poor design, technological deficiencies included the use of biomass in areas without sufficient feedstock supply and a lack of climate proofing of installations. While the DOE has been conducting a series of investment forums on renewable energy, the focus group discussion participants from the electric cooperatives were not aware of or have not been involved in them. Also, a good number of the electric cooperative participants are not knowledgeable about RETs and their use for off-grid electrification. End-users likewise lack understanding and appreciation of RETs, believing in the common notion that renewable energy is expensive, intermittent and therefore inferior to fossil-based energy sources.

## Information for use in planning and project development

The Renewable Energy Act and concerns about climate change have evidently generated a high level of interest in renewable energy development. However, interested parties are held back by the lack of information relevant to planning and project development purposes. Over the years, the DOE, the SPUG and the NEA have prepared studies on hydro development. Winrock International and Preferred Energy, Inc. have likewise initiated wind energy resource mapping in partnership with the NREL, and USAID has funded a number of resource assessments on biomass and hydropower. However, most of these data are not readily available to the public. It is common practice for the DOE to conduct bid solicitations for the development of potential sites where feasibility studies have been conducted. Aside from studies on specific sites,

information and planning tools that can be used by electric cooperatives and other private developers are essential for identifying and conducting renewable energy development assessment work.

### Capacity building on renewable energy development and evaluation

The focus group discussions and field visits revealed deficiencies in the capacity of electric cooperatives, project developers and local government units in the use of RETs, especially in off-grid areas. There was evidence of poor design and inappropriate technology choices in some of the areas visited. Moreover, considering that RETs are varied and there are nuances of application in each site, pertinent government agencies must be considerate when evaluating projects for approval. It is also observed that while the ERC may have the necessary competence in evaluating on-grid and fossil-based technologies, it may not have sufficient training and expertise in renewable energy. Thus, it is essential that the gap in capacity building in renewable energy development and project evaluation be addressed for the benefit of both private and government stakeholders.

### EU – Access to Sustainable Energy Programme

The Access to Sustainable Energy Programme involves the EU supporting the government of the Philippines in achieving inclusive economic growth through access to electricity and energy services by a greater number of Filipinos. The programme is supported by EUR 60 million (USD 63.5 million) in grants from the EU and is being implemented with the assistance of the World Bank. Activities to be undertaken are expected to directly contribute to the attainment of the government's 90% household electrification target by the end of 2017 by providing basic electricity services to remote and poor households through PV mainstreaming, pre-paid metering and mini-grids using renewable energy or renewable energy-hybrid systems in remote islands.

Among these activities are:

- Technical assistance towards policy and institutional reforms for total electrification and enhanced power-sector management. This includes capacity-building support to the DOE on enhanced power-sector management, household electrification and renewable energy development; to the ERC on regulatory reforms; and to the NEA and electric cooperatives focusing on development and training on planning tools, such as automated and comprehensive characterisation of power projects and electrification schemes systems, including the RE4RE system. There will also be a special assistance programme for electric cooperatives and communities in *Bangsamoro* areas.
- Investment support for solar PV mainstreaming that will deploy solar home systems using a utility-based fee-for-service approach and grid-tied solar PV power projects.
- A call for proposal facility for innovative energy solutions in support of job creation, livelihood and climate-resilient communities.
- Programme management, including monitoring and evaluation.

The programme, as currently designed, could play a critical role in addressing some if not all of the issues and gaps that have been identified in this study.

# 6. Recommendations

If the Philippines is to achieve 100% electrification, it will be necessary to extend electricity service to communities mainly located on small islands and remote communities. The cost to do this is high, such that the government alone will not be able to completely cover the costs of these investments. For this reason, the government is targeting private-sector participation. However, the risk-reward profile of electrifying small and remote areas is not attractive. Thus, it is necessary that the issues and barriers that exist in terms of regulatory and administrative processes, market conditions, technological expertise and access to information be addressed.

The goal of the national government is clear: inclusive growth. From the perspective of national priorities, rural electrification is basic infrastructure that should be pursued with great fervour. But reaching the remaining unserved households in remote and off-grid areas represents a tremendous challenge for the energy sector. For this reason, the DOE realises the need to intensify rural electrification by means of renewable energy mini-grids. The private sector could be a major partner in this endeavour.

In order to facilitate effective implementation of the recommendations below, it is important that capacity building takes place for the relevant government agencies and other stakeholders, as well as some general public awareness campaigns.

As stated at the outset, the objective of this study is to determine ways to accelerate the use of renewable energy mini-grids in pursuit of off-grid electrification. Based on the review and consultations undertaken, the following are some practical and actionable recommendations focused on resolving the issues and perceived barriers to the implementation of these projects.

A summary of the recommendations is presented below in Figure 6.1, and the details are outlined in the following sections.

Figure 6.1 Summary of Recommendations

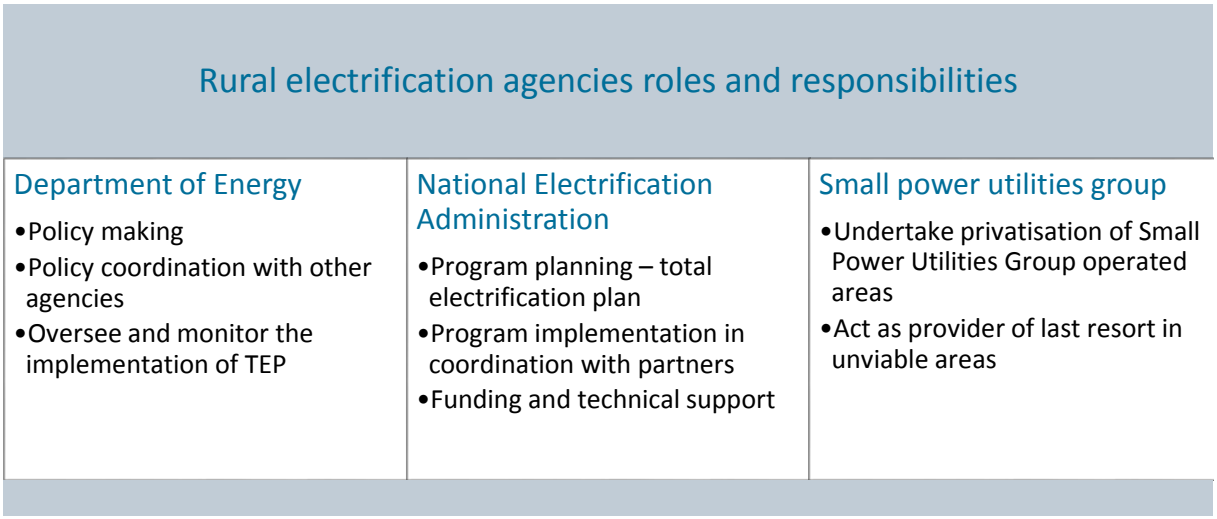

## 6.1. DEFINITION OF ROLES AND RESPONSIBILITIES

### Key government agencies

In order to avoid overlaps and promote synergy among the DOE, the NEA and the SPUG, it is important to clearly define each agency's roles and to delineate functions as well as areas of responsibility and accountability. This also involves identifying and setting protocols in expected areas of collaboration and/or coordination.

Suggested functional delineations to avoid existing overlaps and promote accountability of governance include:

Figure 6.2 Demarcation of roles and responsabilities




### The private sector, NGOs and other stakeholders

It is important to emphasise the essential role that government support of private-sector participation can play. Indeed, it would be advisable to acknowledge and institutionalise the roles of the private sector, NGOs and other stakeholders. The implementation of renewable energy in off-grid communities may be accelerated once the roles of these NGOs are institutionalised and incentivised as an integral part of the off-grid electrification programme. As electrification projects are implemented, local governments should be tapped to help improve livelihoods and other income-generating activities. Electric cooperatives should be encouraged to work with the private sector in areas they want to serve, but are unable to because of a lack of financing or technical expertise. Joint venture arrangements among electric cooperatives or between electric cooperatives and private investors should be encouraged. The privatisation of assets and operations by the NPC the SPUG should also be carried out in line with the relevant policies and regulations.

### Coordination

Timely and proper coordination and collaboration among government agencies within and outside the energy sector are essential aspects of off-grid programme implementation. At the local level, local government units and agencies – such as the departments of Trade and Industry, Health, Education, and Social Welfare – should be considered as important collaborators in the implementation of off-grid electrification solutions.

## 6.2. UNDERTAKE COMPREHENSIVE AND STRATEGIC PLANNING

### Total Electrification Plan

Under the National Electrification Administration Reform Act of 2013, the National Electricity Administration is mandated to prepare a Total Electrification Plan in consultation with energy agencies and all stakeholders. It is therefore advisable and appropriate for the NEA to prepare this plan. A comprehensive plan delineating clear electrification objectives and concrete strategies, as well as programmes with specific sections on the electrification of off-grid areas, could then be integrated into the Philippine Energy Plan. It would be sensible for a significant segment of the Total Electrification Plan to include a Missionary Electrification Development Plan focused on the electrification of unserved unviable areas and those that have limited access to electricity.

### Missionary Electrification Development Plan

The Missionary Electrification Development Plan will form a key part of the Total Electrification Plan. The current version should be revised to focus on:

- providing access to small, remote and isolated areas without electricity
- increasing service hours and service reliability in areas with limited supply, *i.e.* SPUG-operated and others, with the goal of providing reliable 24-hour electricity service capable of supporting commercial and industrial productive uses to enhance livelihood opportunities and increase incomes
- strategically using RETs to lower generation costs, enhance service reliability, extend service hours and avoid the use of fossil fuel
- exploiting technology choices that are based on least-cost approach in order to wisely use the limited government resources available for electrification.

It is also necessary for the DOE, ERC, NEA and SPUG to reach agreement on the definition of certain terms. This includes the definition of energy access, the minimum level of electrification, mini- and micro-grids, and the coverage of missionary electrification, so that all the players have a common understanding of the plan, its objectives and targets. The definition of these terms will impact the setting of regulatory frameworks, implementing guidelines and permitting processes involving projects for off-grid electrification.

### Strategy

The definition of a clear medium- to long-term strategy for rural electrification appropriate to the location and type of areas to be energised is necessary. The cost effectiveness of electrifying isolated areas must also be a prime consideration in this strategy. The distance to a grid, population density and electricity demand are factors to be considered for extending lines to connect to the grid. Areas that are far from a grid are better served by using off-grid and standalone solutions such as:

- the use of mini-grids or micro-grids in close-knit communities, both on islands and in remote land-based areas, using either RETs or renewable energy-diesel hybrids, based on available local renewable energy resources
- the use of individual, standalone household electrification alternatives, such as PV solar home systems for highly dispersed households.

It is essential to prioritise the use of renewable energy, either in hybrids or as stand-alone systems, in small, remote, isolated off-grid areas where sustainable renewable energy resources are available. Based on the review of international studies, RETs are appropriate for off-grid applications and can reduce generation costs, enhance service reliability, and extend service hours when compared to diesel power generation. Renewable energy, likewise, is clean technology that can help mitigate climate change and provide climate resiliency. The use of renewable energy mini-grids in rural electrification, where appropriate, should be institutionalised as part of the solution and streamlined into the off-grid electrification plan. To achieve this, it is necessary to establish and issue guidelines on when and how to choose renewable energy and renewable energy-hybrid technologies.

## 6.3. ESTABLISH CLEAR POLICY APPROACH FOR MINI-GRIDS

### Universal Charge for Missionary Electrification

It would be appropriate for the criteria for accessing universal Charge for Missionary Electrification subsidies to be based on the unviability of the area being served, regardless of

the type of entity providing the service. Thus, electric cooperatives, NGOs and joint ventures between electric cooperative and the private sector should be allowed access to the subsidies provided that the area they are serving has been determined to be unviable according to the intent of the Electric Power Industry Reform Act. It is important to emphasise that the Universal Charge for Missionary Electrification subsidy be allocated to buy down the cost of serving consumers in unviable areas and to assure cost recovery to entities entering these unviable areas.

The best way to resolve inequity in the use of the Universal Charge for Missionary Electrification funds may be for the DOE to issue and implement a graduation policy for access to the Universal Charge for Missionary Electrification subsidies. Such a policy would ensure that funds are made available to the unviable areas that need it the most. In addition, it is advisable for guidelines to be established that ensure that the Universal Charge subsidy benefits the intended beneficiaries and is not used as a continuing operational subsidy for fossil-based power generation in areas that are already viable.

To ensure the timely release of Universal Charge for Missionary Electrification funds, it is necessary to streamline administrative processes. This extends to revising existing DOE policy or ERC resolutions and allowing the payment or release of Universal Charge for Missionary Electrification subsidies by PSALM directly to project developers instead of going through the SPUG. Such a revision would be similar to the procedure for the release of cash incentives for renewable energy in off-grid areas.

### Incentives

Grant renewable energy developers in off-grid areas additional incentives based on capacity, in addition to energy-based incentives. Other incentives may be given in the form of up-front capital subsidies or rebates given over a period of years. Pilot projects to be funded by the EU Access to Energy Program may look into how incentives and subsidies could be given without negatively affecting or distorting the commercial markets.

Optimise the implementation of incentives under the Renewable Energy Act, especially as it relates to off-grid electrification, *i.e.* the renewable energy Portfolio Standard, Green Power Market and others. Priority should be given to small-scale/missionary electrification projects in using the renewable energy trust fund.

The DOE and NREB might also review the formula for computation for cash incentives for renewable energy in off-grid areas set by the ERC to encourage conversion to full renewable energy in areas where sufficient renewable energy resources are available. Currently, the formula is such that as the percentage of renewable energy in a system increases, the cash incentive decreases. Thus, there is no reason for developers to increase renewable energy capacities beyond a certain renewable energy penetration level.

## 6.4. REVIEW REGULATORY APPROACH FOR MINI-GRID PROJECTS

It would be advantageous for administrative and permitting processes to remove duplications, redundancies and unnecessary requirements to avoid delays and deter market entry by the private sector, especially smaller operators. It is recommended that small-scale projects (below 200 kW) be subject to simplified and less stringent regulations in order to reduce transaction costs and facilitate project implementation, especially in areas left behind. Specific recommendations follow below.

### Renewable Energy Service Contract approval process

Review the Renewable Energy Service/Operating Contract application requirements to limit the number of involved government offices, reduce the required signatures to the minimum and shorten the processing time. The opportunity exists to look into the development of a simplified set of guidelines and standards for small-scale projects implemented in off-grid areas. It would be appropriate for projects of this size to have a checklist system similar to that of non-commercial projects. Fees for this process could be removed or reduced in order to minimise transactional costs for these projects.

### QTP accreditation and selection

Develop a simple checklist and limit requirements for accreditation for small-scale project developers, electric cooperatives, NGOs and community organisations to the bare essentials. Electric cooperatives could also be given the choice to either waive these areas to a private operator or to undertake a joint venture arrangement with a private entity in order to serve such areas.

### Competitive selection process requirement

Replace the competitive selection process for projects in missionary electrification areas with benchmarking. Considering the difficulty of attracting investments in off-grid areas, the requirement for competitive selection for projects in missionary electrification areas is considered unnecessary, especially if electric cooperatives decide to undertake the electrification in partnership with the private sector. The objective of controlling costs and evaluating suppliers could be met through more efficient and appropriate methods for small-scale, off-grid projects.

Rather than a competitive selection process, benchmarking may be used to compare proposals. For this purpose, the current power generation costs and level of service coverage by the SPUG may be used as a benchmark upper limit.

### Tariff determination

Facilitate a more efficient tariff determination process. The ERC might issue benchmark or tariff methodology (akin to FIT in the main grid) for each RET, both hybrid and stand-alone systems, in the off-grid areas. It would be appropriate for the benchmark or tariff methodology to consider the complexity and difficulty involved in off-grid electrification such as location (distance and logistical challenges), technology, capacity and manner of application. With the benchmarking approach in place, it will not be necessary for the ERC to conduct public hearings in every area.

## 6.5. INCREASE PROJECT DEVELOPMENT AND EXECUTION SUPPORT

### Financing

It would be valuable for government agencies such as the NEA to make financing available to fund renewable energy projects, especially for off-grid electrification. The NEA, for example, could utilise or allocate a portion of its rural electrification grant funding to support the development of renewable energy mini-grids instead of using such funds to support line extensions only.

Finally, it is recommended that the DOE and NEA collaborate with financial institutions to design innovative and appropriate financing mechanisms for renewable energy financing. The NEA might consider designing a guarantee mechanism for renewable energy investments in off-grid areas for electric cooperative loan borrowers.

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# Appendix 1: Energy-sector players and their roles in rural electrification

| Institution/ private sector | Role in rural electrification | Primary role in off-grid/ missionary electrification |
|---|---|---|
| **Policy and regulatory agencies** | | |
| **DOE**<br><br>Headed by the Secretary of Energy, who reports to the president of the Philippines | • Performs overall policy, planning and strategy formulation<br>• Carries out oversight function<br>• Qualifies renewable energy developers and issues Renewable Energy Service Contracts or Biomass Renewable Energy Operating | • In charge of developing the Missionary Electrification Development Plan and endorsing to ERC<br>• Pre-qualifies QTP, coordinates the entry of new power providers and QTPs, and issues certification of competitive selection process<br>• Implements projects, conducts studies and provides technical assistance on renewable energy project implementation through its ARECs |
| **ERC**<br><br>An independent quasi-judicial body headed by a commissioner appointed by the president of the Philippines | • Issues permits and Certificate of Compliance (COC)<br>• Issues small grid guidelines<br>• Approves transmission and distribution rates<br>• Approves Power Supply Agreements | • Approves new power providers True Cost of Generation Rate and Subsidised Approved Generation Rate<br>• Approves QTPs Agreements and issues Authority to Operate (ATO)<br>• Approves QTPs Full Cost Recovery Rate and Subsidised Approved Retail Rate<br>• Determines Universal Charge for Missionary Electrification rates<br>• Approves cash incentives for renewable energy generation in off-grid/missionary areas |
| **NEA**<br><br>A government corporation headed by an administrator appointed by the president of the Philippines, reports to the Board headed by the DOE Secretary | • Supervises electric cooperatives' planning and operation<br>• Formulates and implements the Total Electrification Plan in coordination with the SPUG<br>• Reviews and assists electric cooperative in the preparation of Distribution Development Plan<br>• Provides electrification financing (loans and grants) to electric cooperatives<br>• Provides technical, financial and institutional capacity building to electric cooperatives | • Directs and provides subsidy assistance to electric cooperatives in electrification of unserved areas<br>• Encourages embedded generation by electric cooperatives<br>• Encourages use of renewable energy by electric cooperatives |

| Institution/ private sector | Role in rural electrification | Primary role in off-grid/ missionary electrification |
|---|---|---|
| **PSALM**<br><br>A government corporation headed by a president appointed by the president of the Philippines | • Manages fund/receives universal charge for missionary electrification<br>• Ensures collection of Universal Charge for Missionary Electrification by distribution utilities | • Releases payment of Universal Charge for Missionary Electrification funds to the SPUG<br>• Releases payment of renewable energy cash incentives to renewable energy developers |
| **NPC-SPUG**<br><br>A unit of the NPC. The NPC is headed by its president and CEO and reports to its board, headed by the secretary of the DOE | • Generates power in small islands and mini-grids<br>• Facilitates privatisation of small island grids<br>• Sources minimum percentage of power from renewable energy<br>• Collaborates with NEA on Total Electrification Plan | • Generates and distributes power in missionary areas waived by electric cooperatives and where QTP is not interested or not qualified<br>• Consolidates and petitions for Universal Charge for Missionary Electrification subsidy requirements of the SPUG, renewable energy developers, new power providers and QTPs<br>• Petitions for approval of true cost of generation rate and subsidised approved generation rate<br>• Releases payments of Universal Charge for Missionary Electrification funds to new power providers and QTPs |
| **DUs**<br>**Electric cooperative & private investor-owned utilities**<br><br>(private sector) | • Prepare their respective Distribution Development Plan<br>• Assist the DOE/NEA in identification of unserved/missionary areas<br>• Collect Universal Charge for Missionary Electrification from end-users<br>• Select power provider/new power provider in SPUG small island grids<br>• May generate power within their franchise | • Distribute power in SPUG areas<br>• Identify remote and unviable areas for waiver to QTPs<br>• Option to become power supplier or QTP in missionary areas<br>• Mandated to source a minimum percentage of supply from renewable energy (upon issuance of Renewable Portfolio Standards rules)<br>• Take charge of power dispatch |
| **New power provider**<br><br>(private sector) | • Takes over SPUG generation in small islands | • Petitions for approval of true cost of generation rate and subsidised approved generation rate<br>• Petitions for renewable energy cash incentives<br>• Mandated to source a minimum percentage of supply from renewable energy (upon issuance of Renewable Portfolio Standards rules) |

| Institution/ private sector | Role in rural electrification | Primary role in off-grid/ missionary electrification |
|---|---|---|
| **QTP**<br><br>(private sector) | • Assumes role of the alternative service provider in remote and unviable areas; provides both power generation and distribution service in selected areas, where the DUs cannot serve for any reason. | • Builds, owns and operates power generation and distribution facilities in missionary areas upon approval of the DOE<br>• Petitions for approval of full cost recovery rate and Subsidised Approved Retail Rate<br>• Petitions for renewable energy cash incentives<br>• Mandated to source a minimum percentage of supply from renewable energy (upon issuance of Renewable Portfolio Standards rules) |
| **Local government unit/NGO/ privately owned power systems** | | • In the absence of SPUG/electric cooperative/QTP, generates and distributes power on limited/informal basis in unserved areas |


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