Asia-Pacific
Economic Cooperation

Peer Review on Low Carbon Energy Policies in the Philippines

Final Report

20 November 2013

Endorsed by the APEC Energy Working Group

CONTENTS

PREFACE

The APEC Peer Review on Low Carbon Energy Policies (PRLCE) was endorsed by the APEC Energy Ministers at the 2010 Energy Ministers Meeting. The review is an extension of APEC's Peer Review on Energy Efficiency (PREE) and generally follows the same guidelines. The PRLCE seeks to achieve the following objectives:

- Share information on low carbon energy performance as well as on policies and measures for improving and promoting low carbon energy in respective economies;
- Provide opportunities for learning from the experiences of other economies and for broadening the network among low carbon policy experts;
- Explore how low carbon goals on an overall and /or sectoral basis and action plans could be effectively formulated in each economy under review, taking into account the range of possible strategies that could be used, according to the circumstance of each economy;
- Monitor progress on attaining low carbon energy goals on an overall and/or sectoral basis and implementing action plans, if such goal and action plans have been already formulated at the time of the review, and
- Provide recommendations for voluntary implementation on how implementation of action plans could be improved with a view to achieving low carbon energy goals.

The Philippines is the second economy who volunteered to undertake the low carbon energy peer review. This report presents the results of the peer review of low carbon energy policies conducted in Makati, Philippines.

The primary accountability for each peer review is shared by the economy being reviewed and the Review Team. The peer review in the Philippines was conducted by a team of nine experts (see Appendix A) who visited the Philippines from 19-23 November 2012.

During the visit, the Review Team had comprehensive discussion on low carbon energy policies in the Philippines with representatives and experts from government ministries and agencies, private and state companies (see Appendix B). The Review Team wishes to thank all the presenters and others who spent valuable time with the team for discussions, especially the representatives of the Renewable Energy Management Bureau of the Philippine Department of Energy who organized the event.

EXECUTIVE SUMMARY

The Renewable Energy (RE) Act of 2008 which was signed into law last December 16, 2008, affirms the government's commitment to accelerate the exploration and development of renewable energy (RE) resources in the Philippines. It also mandates the development of a "strategic program" to increase RE usage. The RE Act of 2008 likewise gave birth to the Renewable Energy Management Bureau (REMB) and the National Renewable Energy Board (NREB). While the REMB-DOE as mandated by the Law led the formulation of RE plans and programs in consultation with its stakeholders, the NREB serves as its guiding arm when deemed necessary. Further to its benefits, the RE Act will try to address possible bureaucratic constraints in developing RE by streamlining the registration process and promoting transparency and open competition. Future policy requirements to commercialize RE, such as the formulation of a feed in tariff (FIT) and bidding for its allocation, are submitted to ERC and were approved with revisions. In conjunction with the enactment of the Act, the National Renewable Energy Program (NREP) was formulated.

The NRE) presents the overall approach to accelerate the development and utilization of the RE resources in the country. The NREP begins from the individual work programs which are referred to as the sectoral sub-programs for each of the RE resource covered under the RE Law, namely: geothermal, hydro, biomass, wind, solar, and ocean. Each sectoral sub-program follows a roadmap which serves as a framework for the achievement of the market penetration targets of a particular RE resource.

The PRLCE team is pleased to note that after the enactment of the RE Act of 2008, the economy is successfully implementing some of the policies and programs formulated in conjunction with its implementation. While some of them are being successfully implemented, some needs further action and attention, which resulted to drawing of a number of recommendations from the experts.

While several developers have shown significant interest in investing in renewable energy, most however would be discouraged due to time-consuming regulatory procedures. To uplift the interest of investors the government should review its regulatory procedures to shorten the time usually spent in processing the documents required from RE developers. Likewise, actions to reduce the number of permissions and substantially reduce the timeframe to obtain consents such as legislative reform, improved process facilitation (One Stop Shop), and increased staff resourcing will reduce the costs to the developers as well. In addition, it is recommended to develop a database of requirements, (e.g. Checklist, best practices, etc,) where the entire relevant government agency as well as RE developers can look for reference to avoid duplication of requirement and hence, facilitate processing. Relatedly, the Team found it necessary for a Ministerial level action which will establish a Ministerial decision

(action plans) to address the issue on tedious processing of document which will also consequently achieve the government's goal of good governance.

While the economy was able to formulate a lot of policies and programs such as the NREP; the National Biofuels Program; the NEECP and other energy related plans and programs to help them achieve their goals, these should be harmonized and the updated copies be posted in a single website location. The plans should each quote the aims of the relevant legislation that they are seeking to fulfill.

The setting of effective RE targets requires a sound platform of scientific information from which the potential of RE generation can be estimated. The existing modeling work will be enhanced with a structured plan to extend the scope of models of primary energy resource and land use. For instance a model of the potential use of energy resources should include competing sectors in electricity generation, alternative fuels production, and industrial processing. Model outputs should include long term electricity prices, biofuel prices, vehicle fleet profiles and environmental and health related externalities at a multi-regional level. A range of scenarios can then be developed and progressively modified as further information on resource use becomes available.

Several recommendations were also provided on a per RE resources and technology basis. It is recommended that the economy should have comprehensive feedstock plans to prevent shortage on biofuels resources. On geothermal, the Team found out the potential of low enthalpy geothermal for non-energy, hence it was recommended that the economy should look into its further development. Since there are also indication of increased solar and wind for power generation in the next 20 years, the economy should also consider to set its target for off-grid solar and wind power generation. Similarly for hydro resources, the experts recommended the economy to increase its technological research on small hydro systems. Generally, recommendations for specific RE sources were focus on increasing researches, renewable portfolio standards (RPS), capability enhancement and setting of targets specifically for off-grid.

On greenhouse gas management, since the transport sector and energy sector together contribute about 70% of GHG emissions in the Philippines, recommendations are separately given to the transport sector and the energy sector.

Finally, strong recommendations were provided for the feed-in-tariff (FiT) such as the introduction of additional incentives based on technology selection and local content as well as developing FiT for sub-categories of RE technologies depending on technology maturity, regional application and socio-economic conditions (e.g. solar PV for household, solar farm, commercial rooftop utilization, etc.) among others.

The likelihood of implementing these recommendations will possibly provide the economy direction in achieving energy sustainability and security as well as in achieving low carbon energy goals in the future.

RECOMMENDATIONS

Institutional Context

Recommendation 1

Regulatory procedures for RE development should be less time-consuming.

Recommendation 2

It may be worthwhile to reinforce the policy formulation function of REMB for RE, in collaboration with EPPB which is the policy formulation group of the DOE, to increase feedback from policy implementation to policy formulation at the implementation of RE development proceeds.

Recommendation 3

It may also be worthwhile to reconsider the composition of NREB to make governmental and private members in equal number, thus giving the independent chairperson a casting vote, which will give more voice to the private sector and enhance the neutrality of NREB.

Renewable Energy Goals, Targets and Strategy

Recommendation 4

The NREP; the National Biofuels Program; the NEECP and other energy related plans and programs should be harmonized and the updated copies be posted in a single website location. The plans should each quote the aims of the relevant legislation that they are seeking to fulfill.

Recommendation 5

Implement a review in processing of documents to reduce the costs to developers in obtaining consents, permits and licenses.

Recommendation 6

Implement broad scope multi-regional techno-economic modeling of the Philippines energy and agricultural economies to provide more certainty on future targets and investment strategies.

Recommendation 7

Set and monitor the penetration of national RE goals into barangay plans and where relevant sitio plans.

Recommendation 8

Provide more technical standards along with an Information Education and Communication campaign to enhance adoption of sustainable technologies.

Regulation and Infrastructure

Recommendation 9

The Team found it necessary for a Ministerial level action which will establish a Ministerial decision (action plans) to address the issue on tedious processing of document which will also consequently achieve the government's goal of good governance;(this recommendation is on top of the recommendation given in "Goals and Strategies" part which generally aimed at reducing cost incurred by RE developers in processing the required documents)

Recommendation 10

In addition to the issue on the tedious processing of document, it is recommended to develop a database of requirements, (e.g. Checklist, best practices, etc,) where the entire relevant government agency as well as RE developers can look for reference to avoid duplication of requirement and hence, facilitate processing;

Recommendation 11

Develop a comprehensive Information Campaign Plan (regulatory and statutory requirements) that would include those in the local government and the general public;

Recommendation 12

Monitoring and evaluation of project-related activities should continue even after the project has been implemented;

Recommendation 13

Maximize the application of GFI's comprehensive loan packages, especially on capacity enhancement;

Recommendation 14

Need to review RE Law to give more attention to off-grid RE issues; The DOE, RE developers and NGCP should continue its coordination and dialogues to address transmission/grid issues;

Biofuels and Biomass Energy

Recommendation 15

Government biofuels stockpiles should be set in order to prevent shortage;

Recommendation 16

More R&D should be undertaken to support the domestic uptake of biofuels;

Recommendation 17

Upgrading of the existing biomass power plant (i.e sugar industry) should be supported;

Recommendation 18

Small and medium size biogas technology for rural areas should be implemented since it can be an alternative sustainable energy source;

Recommendation 19

Renewable Heat Incentives (RHI) should be introduced support RE as an alternative source of heat, including cogeneration.

Geothermal, Solar and Wind Energy

Recommendation 20

Enhance the promotion of non-power applications of geothermal energy.

Recommendation 21

Develop incentives to encourage the use of low enthalpy geothermal energy in rural areas (e.g. FIT for low enthalpy geothermal).

Recommendation 22

Accelerate the use of low enthalpy geothermal energy in rural areas (e.g. off grid areas) by developing value-added geothermal facilities which produce both heat and power for industry, commercial and household sector use, especially in remote areas.

Recommendation 23

Set the target for the development of solar and wind for off-grid areas and roof-top solar PV, as well as start creating official statistics for solar and wind;

Recommendation 24

Accelerate the process of finaliing the RPS guideline;

Recommendation 25

The government should increase its efforts in the assessment of potential sites for wind power while assessment of potential sites for solar energy utilization should be underway;

Recommendation 26

Reduce the peak demand in urban areas and improve access to electricity in rural areas by accelerating the development of roof-top solar PV. (Introduce incentives for accelerating its development.)

Recommendation 27

To secure the stable deployment of solar and wind power, accelerate the development of the net metering system, which can be part of the smart grid programme;

Recommendation 28

Leading organizations in solar and wind energy development or deployment face several challenges such as the lack of capable human resources. Securing a sufficient number of staff is critical in achieving targets for 2030.

Hydropower Energy

Recommendation 29

Promotion of multi-scale hydro power supply system's especially in the remote areas;

Recommendation 30

Detailed assessment and publication of water resource distribution;

Recommendation 31

Increase technological research on small hydro power systems;

Recommendation 32

Accelerate the process of contract approval through better coordination among relevant agencies and institutions;

Recommendation 33

Increase training of technical personnel.

Power Supply System: FiT, Smart Grid and Private Participation

Recommendation 34

Develop FiT for sub-categories of RE technologies depending on technology maturity, regional application and socio-economic conditions (e.g. solar PV for household, solar farm, commercial rooftop utilization, etc.);

Recommendation 35

Introduce additional incentives based on technology selection and local content;

Recommendation 36

Accelerate implementation of smart grid beyond the solar sector;

Recommendation 37

Detailed planning of transmission line installation based on associated RE resource assessment

Recommendation 38

Awareness programme to local government and public (not limited to government initiative also require participation from NGOs and private sectors).

Recommendation 39

Formulate a 'win-win" approach to encourage more private sector investments and participation in RE development.

Recommendation 40

There is also a need to intensify human capital development in RE industry to serve the RE industry needs via comprehensive training courses.

Greenhouse Gas Management

Recommendation 41

Life cycle GHG emissions should be analyzed by utilizing the actual data to predict more accurate GHG emissions.

Recommendation 42

To target a higher blending rate with only locally produced bioethanol, in relation to GHG emissions, (i) relevant land use patterns such as land expansion should be examined, (ii) R&D for agricultural technology (e.g., more harvest per ha, less fertilizer application etc.) should be enhanced, and (iii) investment plans and processes should be implemented as soon as possible.

Recommendation 43

For additionally installed RE capacity, life cycle GHG emissions factors of each energy type should be used to estimate the emissions

Recommendation 44

The optimal management of the revenue earned from CERs should be examined to promote RE or reduce GHG emissions afterward

Recommendation 45

Accelerate the registration procedures for applications for FIT qualification and also the joint use of FIT and RPS for RE promotion should be optimized and clarified.

PART 1 : Background Information

This part of the report was contributed by the government of the Philippines and includes basic information on renewable energy and the main institution associated with energy in the economy. The main purpose of this part is to provide the reader with the context within which the review team based its recommendations.

The report shows the aspect of renewable energy including the current policy and objectives as well as renewable energy activities.

INTRODUCTION

1. ENERGY SITUATION

1.1 Primary Energy Supply

The country's total primary energy supply (TPES) in 2010 reached 40.7 MTOE, 3.2 percent higher than the 2009 level of 39.5 MTOE (Figures 1 and 2). This was due to the increase in total net energy imports, compensating for the 0.3 percent decline in total indigenous energy production. Net imports grew by 8.5 percent, from 16.0 MTOE in 2009 to 17.3 MTOE in 2010.

Oil remained as the country's major energy source, accounting for 35.9 percent of the primary energy supply mix, followed by geothermal with 21.0 and coal with 17.3 percent share.

Total primary oil supply increased by 8.4 percent from 13.5 MTOE in 2009 to 14.6 MTOE in 2010. Similarly, total primary coal supply increased by 19.4 percent reaching 7.0 MTOE from 5.9 MTOE in 2009. On the other hand, major renewable energy resources experienced decreases in production levels during the year.[1]

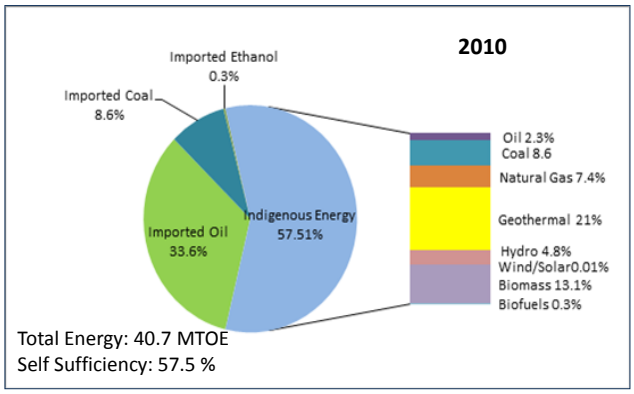


Figure 1: Total Primary Energy Mix (In Percent), 2010

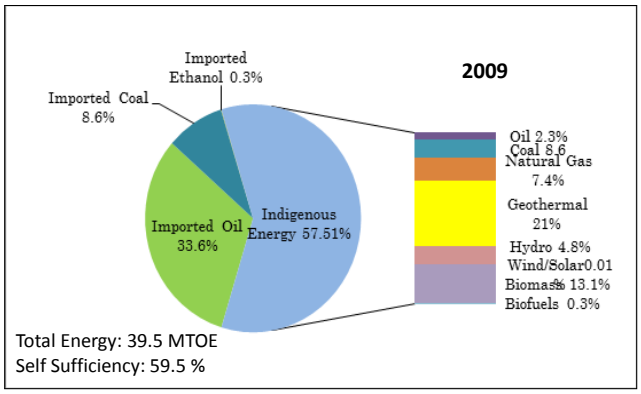


Figure 2: Total Primary Energy Mix (In Percent), 2009

[1] Key Energy Statistics 2010

1.1.1 Indigenous Energy (Domestic Energy Supply)

Total indigenous energy production slightly went down by 0.3 percent from 23.5 MTOE in 2009 to 23.4 MTOE. This is attributed to lower production of local resources-crude oil, natural gas, geothermal, hydro, biomass and biofuels-reducing their contribution to the total indigenous energy supply. However, production of local coal and solar power increased by 41.9 percent and 0.2 percent, respectively.

Table 1. Local Energy Production In Mtoe, 2009 & 2010

ENERGY SOURCE		2009	2010
Fossil Fuels	Oil	0.96	0.92
	Natural Gas	3.2	3
	Coal	2.5	3.5
Renewable Energy	Geothermal	8.9	8.5
	Hydro	2.4	1.9
	Biomass	5.37	5.35
	Biofuels	0.1248	0.1067
	Solar	0.0001	0.0001
	Wind	0.0055	0.0055

1.1.2 Imported Energy Supply

Net energy imports in 2010 accounted for 42.5 percent of the total energy supply, reaching 17.3 MTOE or 8.5 percent higher than the 2009 level of 16.0 MTOE. Net imported energy in 2010 is comprised of 79.1 percent oil and oil products; 20.3 percent coal; and 0.6 percent biofuels (Figure 3).

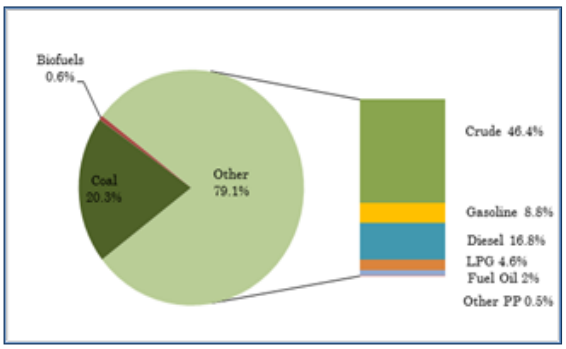


Figure 3 : Net Energy Products Importation, 2010

Net oil importation went up by 9.4 percent from 12.5 MTOE (95,539.9 MB) in 2009 to 13.7 MTOE (104,061.9 MB) in 2010, augmenting the country's demand for oil and oil products. Crude oil comprised the bulk of net energy imports for 46.4 percent share, while 32.7 percent were finished petroleum products.

The country's coal importation exhibited a significant boost of 56.1 percent, reaching 5.8 MTOE in 2010 from 3.7 MTOE in 2009. Indonesia was the country's most signifiacnt coal trading partner accounting for 96.7 percent of the total coal importation in 2010.

Ethanol imports in 2010 increased more than twice from 35.9 kTOE in 2009 to 77.9 kTOE. The rise in ethanol imports may be attributed to non-operation of bioethanol producers in the country due to higher production cost and consequently, the market's preference for lower-priced imported bioethanol.

1.2 Total Final Energy Consumption

As the country's economy grew by record-high of 7.3 percent in 2010, spurred by strong domestic climate, international trade and a renewed confidence in the government, total final energy consumption (TFEC) reached 24.5 MTOE, a 4.2 percent increase from the previous year's level of 23.5 MTOE.

Transport remained as the biggest energy-consuming sector with 36.8 percent share of the total final energy demand, followed by industry with 26.0 percent and residential with 25.0 percent (Figure 4). All sectors registered higher energy consumption in 2010 led by the commercial sector, where energy use grew fastest by 10.4 percent from 2009 to 2010. Industry followed closely with 10.1 percent hike while AFF sector's energy use increase by 5.2 percent. On the other hand, transport sector up by a modest 1.5 percent while the demand from the residential sector posted a minimal increase of 0.2 percent.

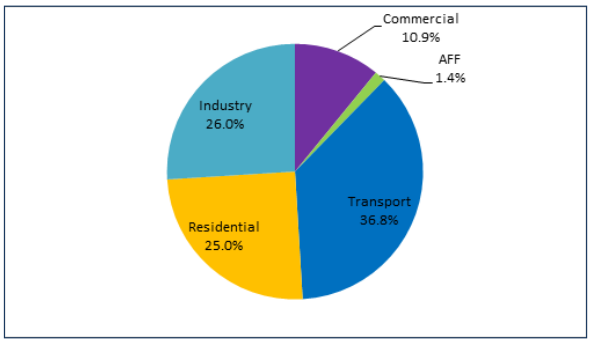


Figure 4. Total Final Energy Consumption By Sector, 2010

2. ENERGY SECTOR: STRUCTURES AND STAKEHOLDERS

2.1 Department of Energy

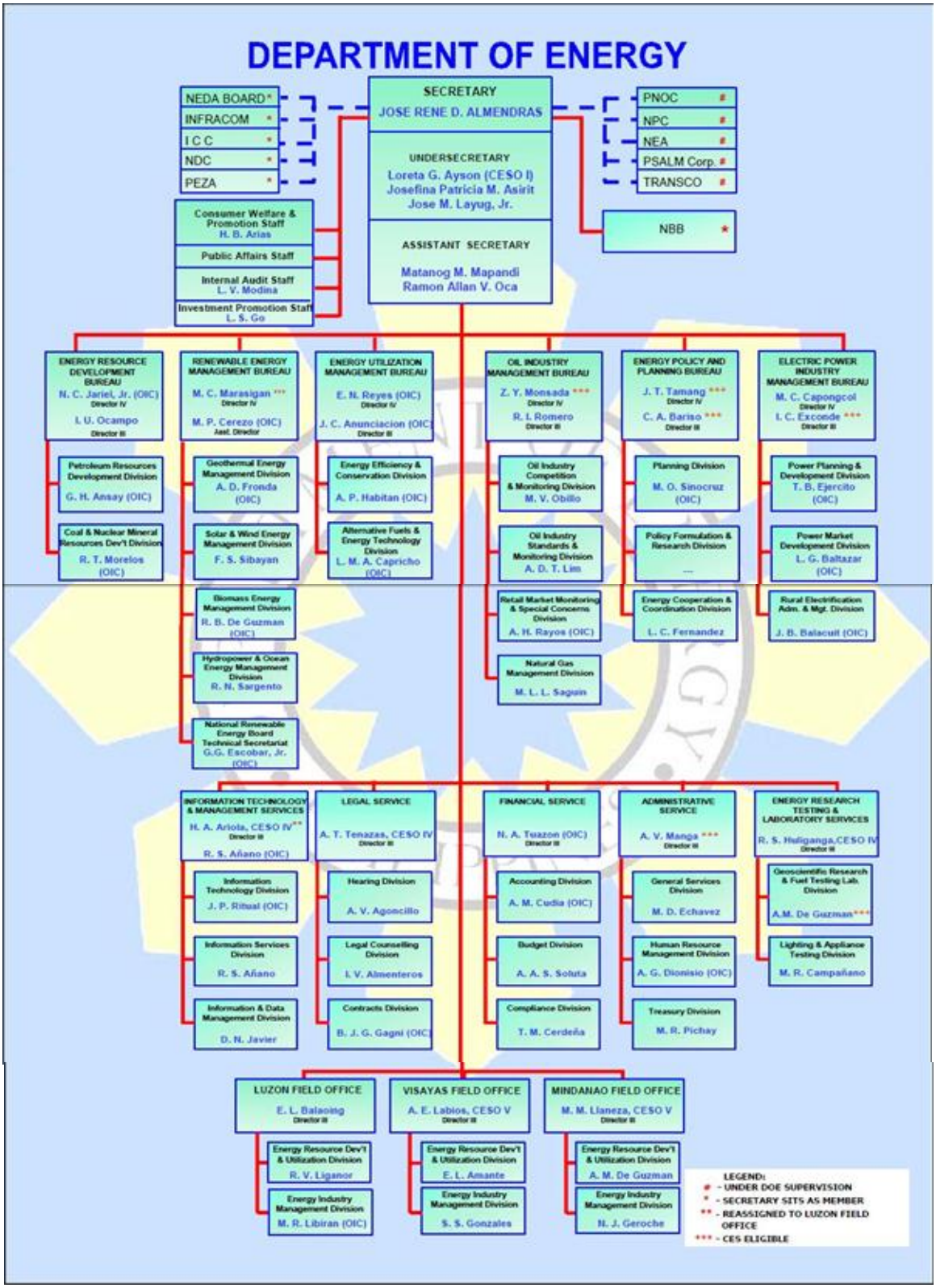
The following are the functions of each bureau presented in the structure of the Department:

2.1.1 Energy Resource Development Bureau formulates and implements government policies, programs and regulations relating to the exploration, development and production of indigenous petroleum and coal resources, and related product and market development thereof.

2.1.2 Renewable Energy Management Bureau implement policies, plans, and programs related to the accelerated development, transformation, utilization, and commercialization of renewable energy resources and technologies.

2.1.3 Energy Utilization and Management Bureau formulates and implements policies, plans, programs and regulations on new energy technologies, alternative fuels and the efficient, economical

transformation, marketing and distribution of conventional and renewable energy resources, and ensures efficient and judicious utilization of conventional energy resources.



Department of Energy Organizational Structure

2.1.4 Oil Industry Administration Bureau formulates and implements policies, plans, programs and regulations on the downstream oil industry, including the importation, exportation, stockpiling, storage, shipping, transportation, refining, processing, marketing and distribution of petroleum crude oils, products and by-products, and monitors developments in the downstream oil industry.

2.1.5 Energy Policy and Planning Bureau

2.1.6 Electric Power Industry Management Bureau supervises the implementation of electric power industry restructuring to establish a competitive, market-based environment, and encourage private-sector participation; ensures adequate, efficient and reliable supply of electricity, and formulates plans, programs and strategies relative to rural electrification.

2.2 Other Related Organizations

2.2.1 Philippine National Oil Company (PNOC) was created on November 9, 1973 through Presidential Decree No. 334, the Philippine National Oil Company (PNOC), to provide and maintain an adequate and stable supply of oil. Focusing its efforts and resources in learning the ropes of the petroleum industry, PNOC rose to occupy market leadership in an industry thought to be the domain of multinationals. Its charter was amended to include energy exploration and development.

2.2.2 National Power Corporation (NPC) is a state-owned company created under Republic Act No. 6395, as amended by Republic Act No. 9136.

2.2.3 National Electrification Administration (NEA) was given certain powers, duties, and functions to attain total electrification on an area coverage basis, to set up cooperatives for the distribution of power, and to determine privately-owned public utilities which should be permitted to remain in operation.

2.2.4 Power Sector Assets and Liabilities Management Corporation (PSALM) structures the sale, privatization or disposition of NPC assets and IPP contracts and/or their energy output based on such terms and conditions that will optimize the value and sale prices of these assets, liquidates NPC's stranded contract costs using proceeds from sales and other properties, including proceeds from the Universal Charge, restructures existing loans of NPC; and collects, administers and applies the NPC portion of the Universal Charge.

2.2.5 National Transmission Corporation (TransCo) protects national government's interests by closely monitoring National Grid Corporation of the Philippines' (NGCP) compliance with the terms and conditions of the Concession Agreement, divests remaining sub-transmission assets to qualified distribution utilities, handles all existing cases including right-of-way and claims which accrued prior to the turnover date (January 15, 2009), and undertakes operation, maintenance,

consultancy and other technical services for the power distribution systems under the Philippine Economic Zone Authority.

2.2.6 Energy Regulatory Commission (ERC) enforces the rules and regulations governing the operations of the Wholesale Electricity Spot Market (WESM) and the activities of the WESM operator and other WESM participants, for the purpose of ensuring greater supply and rational pricing of electricity.

2.2.7 Wholesale Electricity Spot Market (WESM) is a centralized venue for buyers and sellers to trade electricity as a commodity where prices are based on actual use (demand) and availability (supply). The WESM was created by Republic Act 9136, the Electric Power Industry Reform Act (EPIRA) of 2001. This provided for the establishment of an electricity market that reflects the actual cost of electricity and lowers its price through more efficient production through competition.

3. NATIONAL RENEWABLE ENERGY PROGRAM (NREP) - 2011-2030:

3.1 Goals, Objectives and Targets/Roadmap

The NREP seeks to increase the RE-based power capacity of the country to 15,304 MW by the year 2030, almost triple its 2010 capacity level of 5,438 MW.

To realize the goals of the NREP, the following shall be carried out:

1. Institutionalize a comprehensive approach to address the challenges and gaps that would prevent and/or delay wider application of RE technologies in a sustainable manner; and
2. Outline the action plans necessary to facilitate and encourage greater private sector investments in RE development.

On a per technology basis, the NREP intends to:

1. Increase geothermal capacity by 75.0 percent;
2. Increase hydropower capacity by 160 percent;
3. Deliver additional 277MW biomass power capacities;
4. Attain wind power grid parity with the commissioning of 2,345 MW additional capacities;
5. Mainstream an additional 284 MW solar power capacities and pursue the achievement of the 1,528 MW aspirational target;
6. Develop the first ocean energy facility for the country.

The NREP is initially focused towards the addition of RE-based capacity for power generation. The program for non-power applications shall be incorporated later.

The estimates for the expected capacity additions are based on the RE Service/Operating Contracts which have been awarded and are being evaluated by the DOE. These are presented by RE sector in Table 2.

The entry of the above-cited RE-based capacities is highly dependent on the successful implementation of the NREP as well as the policy and incentive mechanisms in the RE Law. Particular attention shall be given to the timely conduct of grid impact studies required for all facilities connecting to the grid.

Table 2. Re-Based Capacity Installation Targets, Philippines

Sector	Installed Capacity, (MW) as of 2010	Target Capacity Addition by				Total Capacity Addition (MW) 2011-2030	Total Installed Capacity by 2030
		2015	2020	2025	2030		
Geothermal	1,966.0	220.0	1,100.0	95.0	80.0	1,495.0	3,461.0
Hydro	3,400.0	341.3	3,161.0	1,891.8	0.0	5,394.1	8,724.1
Biomass	39.0	276.7	0.0	0.0	0.0	276.7	315.7
Wind	33.0	1,048.0	855.0	442.0	0.0	2,345.0	2,378.0
Solar	1.0	269.0	5.0	5.0	5.0	284.0[1]	285.0
Ocean	0.0	0.0	35.5	35.0	0.0	70.5	70.5
TOTAL	5,438.0	2,155.0	5,156.5	2,468.8	85.0	9,865.3	15,304.3

Pursuant to Rule 2, Section 8 of the RE Law's Implementing Rules and Regulations (IRR), the Transmission and Distribution Development Plans of TRANSCO, its concessionaire or successor-in-interest and the distribution utilities (DUs) shall be reviewed regularly to ensure that the interconnection of the RE facilities are incorporated as they become ready for commercial delivery.

Arrangements shall be coordinated with relevant DOE units and its attached agencies as well as TRANSCO or NGCP to trigger actions for intervention, as may be warranted. It must, however, be emphasized that the aggressive development of RE resources shall be balanced with the need to provide an adequate, reliable and high quality power. In a sense, while efforts to facilitate RE entry into the grid shall continue to be intensified, the grid stability shall be ensured as well. Hence, innovative mechanisms to assist the concerned industry participant, as may be necessary, may be developed as the NREP progresses.

Furthermore, for RE projects in off-grid and Small Power Utilities Group (SPUG) or missionary areas, proper coordination among concerned DOE units and its attached agencies (i.e., NPC-SPUG, NEA), as well as the electric cooperatives shall be made. The RE project developers' work programs shall be aligned or harmonized with the Missionary Electrification Development Plan as well as comply with the relevant procedures and guidelines for Qualified Third Parties (QTP) or New Power Providers.

The consolidated RE Roadmap shown in Figure 5 summarizes the milestones and capacity additions envisioned for the respective Sectoral Sub-Programs.

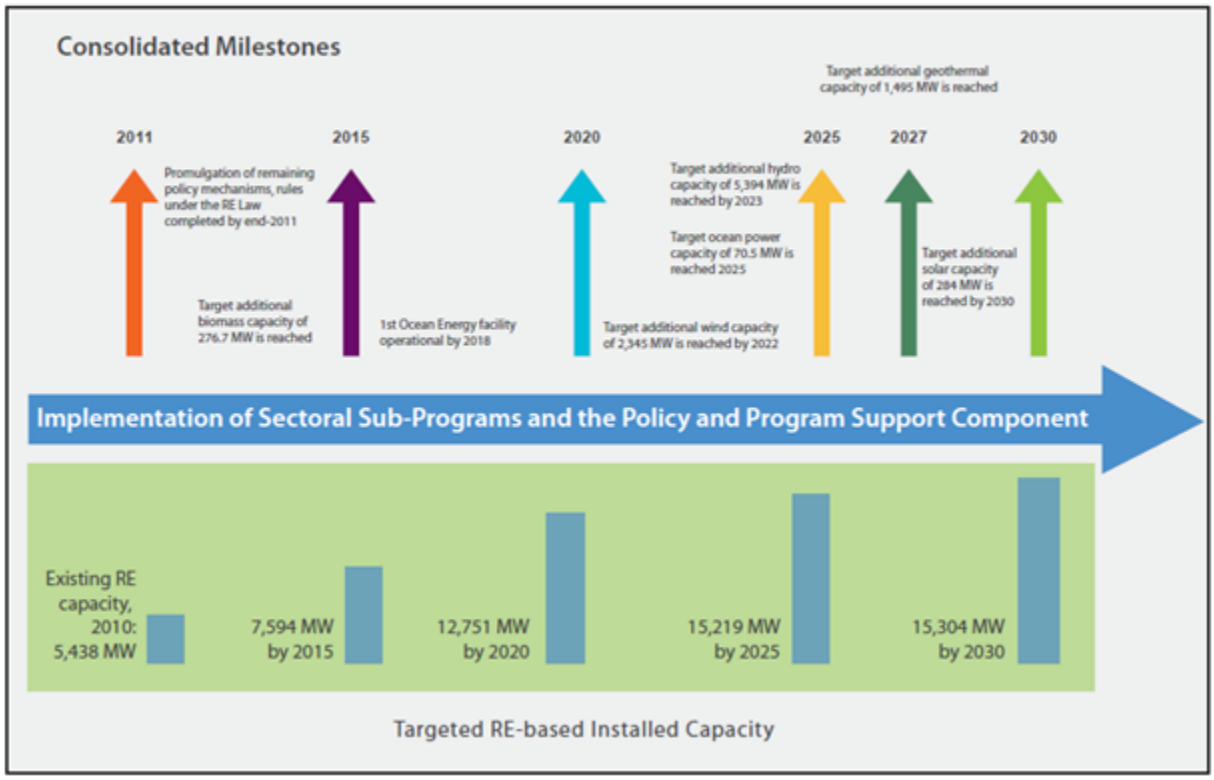


Figure 5: Consolidated Renewable Energy Roadmap

Meanwhile, the expected milestones over the period 2011 to 2030 are reflected in Table 3.

Table 3. NREP Milestones

Sector	Target indicative capacity addition achieved by	Others
Geothermal	2027	Low-Enthalpy Geothermal Resource Assessment completed by 2015
Hydro	2023	Construction of Sea Water Pumped Storage Demo Facility by 2030
Biomass	2015	Mandatory E10 blend for all gasoline vehicles by 2012
Wind	2022	Grid parity by 2025
Solar	2030	Smart Grid and Concentrated Solar Thermal Power Demo completed by 2015; Grid parity by 2020
Ocean	2025	1st Ocean Energy Facility operational by 2018

3.2 NREP Development Framework

The NREP presents the overall approach to accelerate the development and utilization of the RE resources in the country. The framework for its development is shown in Figure 6. The NREP begins from the individual work programs which are referred to as the sectoral sub-programs for each

of the RE resource covered under the RE Law, namely: geothermal, hydro, biomass, wind, solar, and ocean.

Each sectoral sub-program follows a roadmap which serves as a guide for the achievement of the market penetration targets of a particular RE resource. It indicates the milestones over the 20-year planning period, the realization of which depends on the implementation of the following types of activities:

3.2.1 RE Industry Services

This is geared towards facilitating private sector investments in the energy sector. Assistance to the RE Developers shall start from the registration process up to the implementation of the various stages of their respective RE Service/Operating Contracts. Close monitoring of the contracts shall be undertaken to ensure that appropriate interventions within DOE's control, and as authorized by law, are provided in a timely manner to avoid delays in the implementation of their respective work programs. Aside from technical assistance, DOE may also provide advisory services in the areas of market development, business matching, as well as on the various policy and incentive mechanisms under the RE Law to ensure that the RE projects come on stream as expected.

3.2.2 Resource Development

Efforts towards harnessing the huge RE resource potential of the country shall be improved. Among others, these may include: (a) resource assessment, either nationwide or in a particular area/location; (b) conduct of various studies such as those on the market, socio-economic and environmental impact or pre-feasibility of specific RE projects on its own or in partnership with interested groups/ organizations; and (c) optimization studies on the development and utilization of RE resources. To expand the market for RE, studies on its non-power applications, specifically for those of biomass and geothermal energy shall also be undertaken.

3.2.3 Research, Development and Demonstration (R, D & D)

Applied research and development (R & D) shall be undertaken to determine the viability of adapting certain RE systems, technologies or processes in the Philippine setting, in areas where there is no or limited local experience. As may be warranted, demonstration or pilot projects shall be implemented to showcase the feasibility of the technology or process. For instance, a demonstration project on sea water pumped storage shall be conceptualized under the Hydro Sector Sub-Program. A demonstration project on Concentrating Solar Thermal Power technology shall also be pursued. R, D & D activities may be undertaken in cooperation with R&D institutions and technical centers, both local and foreign, as well as interested multilateral organizations, NGOs or private sector partners.

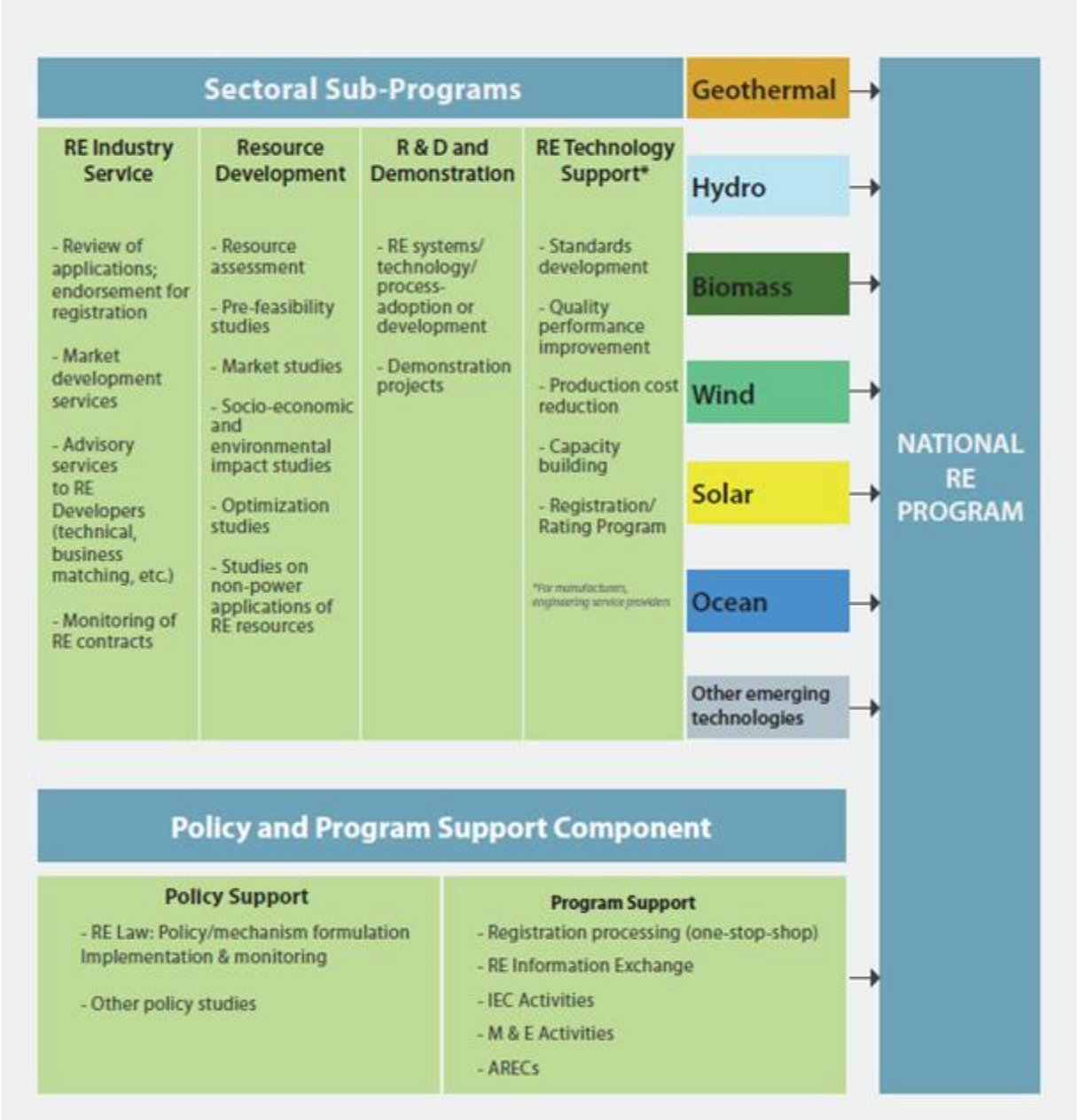


Figure 6: Consolidated Renewable Energy Roadmap

3.2.4 RE Technology Support

The improvement of the quality, performance and cost of local RE systems towards greater consumer protection and their competitiveness with conventional systems shall be further pursued. Among others, these may include: (a) the development of standards for locally manufactured/fabricated equipment or component such as wind towers, PV inverters, etc.; and (b) the establishment of a registration or rating program for engineering service providers. Capacity building activities shall also be conducted to enhance the skills and knowledge of RE stakeholders. DOE shall work closely with partners from the private

sector (i.e., local RE manufacturers and engineering service providers), training institutions and the academe in the development and implementation of the appropriate projects/activities.

The specific projects and activities in each sector shall vary depending on the challenges and gaps facing the sector as well as the expressed needs of the stakeholder groups being served.

The cross-cutting activities are grouped into the Policy and Program Support Component. This involves common activities which require a coordinated and integrated approach to implementation. Policy support mainly involves the continuation of efforts towards the formulation, implementation and monitoring of the mechanisms, rules and regulations prescribed by the RE Law. Program support, on the other hand, covers common activities which need to be undertaken to ensure the smooth implementation of the NREP. Each sectoral sub-program, however, shall also indicate specific areas where policy and program support may be required.

3.3 Sectoral Sub-Programs

Each sectoral sub-program includes an overview of the sector, the roadmap and the various action plans which address the specific needs of the said sector. As earlier mentioned, the DOE formulated the initial draft of each sectoral sub-program based on its knowledge and understanding of the challenges and gaps faced by the sector. These were then presented to the respective stakeholders for comments and suggestions. The work program presented is a result of such consultations. The classification of each project or activity may be adjusted depending on the progress of work (e.g., from Resource Development to R & D and Demonstration).

3.3.1 Geothermal Energy Sector Sub-Program

Geothermal energy comes from the natural heat of the earth. This heat is stored in rock and water within the earth and can be extracted by drilling wells at depths shallow enough to be feasible.

The country's geothermal resources are known to be of high quality since the Philippines lies in the Pacific Ring of Fire. Geothermal wells are scattered all over the country. Recent studies have indicated that the country has 2,027 MW proven reserves and 2,380 MW potential reserves which remain untapped.

Table 4. Targeted Geothermal Capacity Addition (Mw), By Grid

Location	Commissioning Year				Total Capacity Addition, MW	Share %
	2011-2015	2016-2020	2021-2025	2026-2030		
Luzon	100	720	0	0	820	54.8
Visayas	70	140	65	60	335	22.4
Mindanao	50	240	30	20	340	22.7
Total Philippines	220	1,100	95	80	1,495	100.0

The total installation target of 1,495 MW is expected to be met by 2027, with large portion of it being commissioned during the period 2016-2020. The distribution of the targeted capacity addition, by grid, is presented in Table 4. As indicated in the table, the Luzon grid will host the majority, estimated at 55% of the total capacity addition.

The DOE shall continue to actively promote the use of geothermal resources through the Open and Competitive Selection Process of awarding Geothermal RE Operating/Service Contract, an investment promotion campaign in which geothermal sites are offered and bid out to private investors for their development. Other activity thrusts of Geothermal Sector Sub-program are the full utilization or optimization of already known fields and the expansion of geothermal uses, to include small-scale and non-power applications. Resource assessment and exploration in identified, underexplored, and unexplored geothermal areas (high and low temperature/enthalpy) shall likewise be continued. The sector's work program is listed by the type of activity in Table 5.

Table 5. Geothermal Sector Work Program

Type of Activity	Work Program
RE Industry Services	1. Review of applications; endorsement for registration of applications 2. Monitoring of RE contracts 3. Advisory services to RE developers on: • Implementation of policy/ guidelines on direct use and small-scale geothermal energy • Commercialization on Enhanced Geothermal System (EGS)/ Geothermal Heat Pump/Small –Scale Geothermal Energy • Promotion of non-power applications of geothermal energy • Promotion of cascaded use of geothermal energy for development
Resource Development	1. Detailed Assessment of Low-Enthalpy Geothermal Resources Project • Research and Development • Inventory/Mapping/Assessment • Feasibility Study of Low-Enthalpy Geothermal Resources 2. Optimization and Improvement of Geothermal Power Plant Efficiency and Energy Conversion 3. Feasibility Study of Small –Scale Geothermal Energy 4. Study on non-power application of geothermal energy 5. Study on cascaded use of geothermal energy for development 6. Continued resource assessment and exploration in identified, underexplored, and unexplored geothermal areas (high and low temperature/enthalpy)
Resource Development R, D & D	1. Technical Cooperation on Enhanced Geothermal System (EGS)/ Geothermal Heat Pump • Research and Development • Identification of potential areas • Mapping and Database Development • Collaboration with other countries on emerging technology • Feasibility Study • Pilot Study 2. Research/study on Acid Utilization Geothermal Resources
RE Technology Support	Establishment of Geothermal Training Center
Policy and Program Support-Related Activities	1. Drafting of policy/ guidelines on direct use and small-scale geothermal energy • Workshop/Consultation 2. Drafting of policy/guideline on Enhanced Geothermal System (EGS) • Workshop/Consultation 3. Improvement and updating of geothermal resource database 4. Networking for better data access 5. IEC campaign to address environmental and social concerns

3.3.2 Hydropower Energy Sector Sub-Program

Hydropower is the most dominant source of RE-based capacity in the country today. As of 2010, hydropower accounted for 21% of 16,359 MW total installed capacities in the country.

Philippines has vast hydro resources. Studies indicate that total untapped hydro resource potential is estimated at 13,097 MW. It is estimated that 85.7% or the equivalent of 11,233 MW of the hydro resource potential can be developed for large hydro in eighteen (18) sites all over the country. Other sites, 888 in number, have mini-hydro potential capacities totaling 1,847 MW.

Hydropower Sector envisions an addition of 5,394.1 MW hydropower capacity (Table 6). This installation target is expected to be met by 2023. Of the total capacity addition, nine (9) projects with a total capacity of 27.8 MW have already been committed for installation. Six (6) of these projects are located in Luzon while there are two in the Visayas and one in Mindanao.

Table 6. Targeted Hydropower Capacity Addition (Mw), By Grid

Location	Commissioning Year			Total Capacity Addition (MW)	% Share
	2011 - 2015	2016 - 2020	2021- 2025		
Luzon	182.0	2,169.5	1,510.0	3,861.5	71.6
Visayas	84.5	102.4	81.8	268.7	5.0
Mindanao	74.8	889.1	300.0	1,263.9	23.4
Total Philippines	341.3	3,161.0	1,891.8	5,394.1	100.0

The overall thrust of the Hydro Sector Sub-program is the intensification of efforts to develop the huge untapped hydro resource potential of the country. The provision of services to the hydro sector participants shall be sustained over the long-term 2011-2030 to ensure that the targeted hydro capacity addition is met. The sector's work program, by type of activity, is listed in Table 7.

Table 7. Hydropower Sector Work Program

Type of Activity	Work Program
RE Industry Services	1. Review of applications; endorsement for registration of applications 2. Monitoring of RE contracts 3. Advisory Services to RE Developers on: • RE policy mechanisms/guidelines • Sea water Pump Storage (PS) Hydropower Plant • Rural electrification using micro-hydropower
Resource Development	1. Developmental Activities for Micro-hydropower • Commercialization thru Mini-Grid System • Rural electrification using micro-hydropower 2. JICA Optimization Study a. Identification of at least 50 potential sites b. Project packaging of JICA 's optimization studies for hydropower; o Tendering/Bidding and Awarding of contracts o Construction and development activities o Commissioning and Operation 3. Sea water Pump Storage Hydropower Plant • Inventory of potential sea water PS facility
R, D & D	1. Sea water Pump Storage Hydropower Plant • Development of Sea water Pump Storage Plant o Project Packaging o Tendering/Bidding and Awarding of contracts o Construction and development 2. Establishment of Research Center • New technology and designs for hydropower • Redesign and Retrofitting Program
RE Technology Support	1. Development of local manufacturing capability for micro-hydropower equipment and controls 2. Establishment of standards and best practices 3. Technology mentoring
Policy and Program Support-Related Activities	Developmental activities for Micro-hydropower • Formulation of Comprehensive Program • Inventory of projects for optimization

3.3.3 Biomass Energy Sector Sub-Program

Biomass resources refer to natural or processed plants and plant materials, trees, crop residues, wood and bark residues, and animal manure or any organic or biodegradable matter that can be used in bioconversion process.

The country generates substantial volumes of waste residues which could be utilized as fuel. Biomass resources also include biofuels. The Biofuels Law of 2006 mandates the use of two types of biofuels, namely, biodiesel as blend with diesel fuel and bioethanol with gasoline. These two key liquid fuels are produced from agricultural crops and other renewable feed stocks. Despite this substantial potential, biomass utilization in the country is mostly for non-power applications, such as biofuels in the transport sector, fuelwood in the household and commercial sectors and waste residues in agro-industries. Biomass power capacity is only 30 MW as of the first semester of 2010.

Biomass Sector envisions an addition of 276.7 MW biomass power capacity (Table 8) to the grid by the year 2015, based on RE Operating Contracts which have been awarded and pending applications being evaluated by the DOE. Additional projects are expected to be identified once the inventory and assessment of the biomass utilization studies have been completed within the year.

Table 8. Targeted Biomass Capacity Addition (Mw), By Grid

Location	Commissioning Year					Total Capacity Addition (MW)	% Share
	2011	2012	2013	2014	2015		
Luzon	14.8	1.0	31.6	49.9	0.0	97.3	35.2
Visayas	9.0	0.0	26.3	103.3	4.0	142.6	51.5
Mindanao	3.0	0.0	0.0	33.8	0.0	36.8	13.3
Total Philippines	26.8	1.0	57.9	187.0	4.0	276.7	100.0

Table 9. Biomass Sector Work Program

Type of Activity	Work Program
RE Industry Services	1. Review of applications; endorsement for awarding of Operating Contracts and Certificate for Own Use 2. Monitoring of RE contracts 3. Advisory services to RE Developers • RE policy mechanisms/guidelines • Growing of non-food bioenergy crops for biofuels • Growing of high yielding biomass crops • Land availability to support biomass plantations • Infrastructure build-up for E10 • Infrastructure build-up for additional biodiesel plants • Infrastructure build-up for increased biofuel blends
Resource Development	1. Adopt appropriate Waste to Energy Technologies 2. 2nd and 3rd Generation Biofuel Production Technologies 3. Assessment of Biomass Utilization in the Philippines
R, D & D	1. R & D on biomass technology 2. Continuously adopt new technology 3. R, D & D on higher biofuel blend
RE Technology Support	Philippine National Standards for: 1. B5 and B20 2. E20 and E85
Policy and Program Support-Related Activities	1. Review of Existing/Proposed Policies 2. Drafting of DOE Circular on • B5 and B20 • E20 and E85 3. Conduct of IEC/Consultations

The Biomass Sector Sub-program's activity thrusts are as follows: (i) intensive promotional campaign to encourage investments in the biomass sector; (ii) effective and efficient delivery of assistance/advisory services to the biomass sector participants; (iii) assessment of biomass utilization in the country to identify additional projects; (iv) resource development on new and emerging biomass technologies; (v) R, D & D of higher biofuel blends (i.e., flexible fuel vehicle technologies). The sector's work program, by type of activity, is listed in Table 9.

3.3.4 Wind Energy Sector Sub-Program

The country is said to have a very good wind resource potential based on the wind resource analysis and mapping study conducted by the National Renewable Energy Laboratory (NREL). Areas identified to have high potential for wind energy utilization are Ilocos, Mountain Province, Cuyo Island, Basco, Batanes, Catanduanes, Tagaytay City, Lubang, Cabra Islands off the Northwestern cost of Mindoro, western portions of Batangas, Guimaras, Masbate, the northeastern coast of Negros Occidental, and Palawan.

A 2003 World Wildlife Fund (WWF) study likewise identified potential sites with power density of at least 500 W/m^2 and transmission line cost of not over 25% of levelized cost of combined generation and transmission costs. The results of the study show that the Philippines total potential is about 7,412 MW covering 1,038 wind sites.

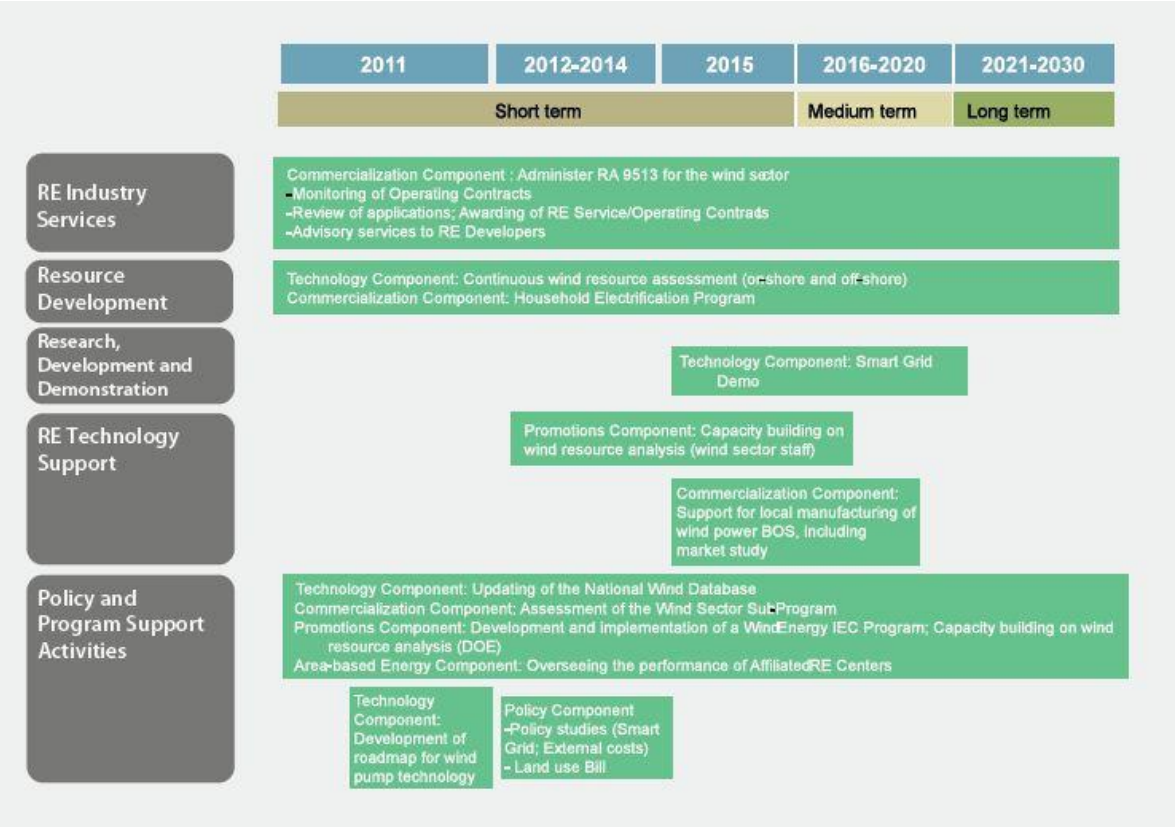
Wind Energy Sector envisions an addition of 2,345 MW wind power capacity, based on the RE Service/Operating Contracts which have been awarded and those that are being evaluated by the DOE. This installation target is expected to be met by 2022.

Table 10. Targeted Wind Capacity Addition (Mw), By Grid

Location	Commissioning Year				Total Capacity Addition (MW)	% Share
	2011 - 2015	2016 - 2020	2021- 2025	2026- 2030		
Luzon	831	840	432	0	2,103	89.7
Visayas	217	0	10	0	227	9.7
Mindanao	0	15	0	0	15	0.6
Total Philippines	**1,048**	**855**	**442**	**0**	**2,345**	**100.0**

The Wind Energy Sector Sub-Program (WESP) is envisioned to support the following policy thrusts of the Philippine Energy Plan: (i) ensuring energy security; (ii) pursuing effective implementation of energy sector reforms; and (iii) implementing social mobilization and cross-sector monitoring mechanisms. The sub-sector set the following activities (shown in Figure 11) to fulfill its goals.

Table 11. Wind Sector Work Program



3.3.5 Solar Energy Sector Sub-Program

Most of the solar energy applications in the country are found in the rural areas, due in part to the rural electrification initiative of the national and local government units (LGUs).

Solar energy applications in the rural areas are mostly photovoltaic (PV) stand-alone systems which range from 20-75 watt-peak (W-p) individual solar home systems to community-based lighting applications (e.g.. streetlights, village centers, and schools). Technological developments have allowed telecommunication companies to use PV as back-up power supply in their remote cell sites in urban areas. Solar energy is most commonly used to supply thermal energy for water heaters.

Based on a study undertaken by the US-National Renewable Energy Laboratory (NREL) using the Climatological Solar Radiation (CSR) Model, the Philippines has an average daily insulation of 5 kilowatt hour per square meter (kwh/m^2).

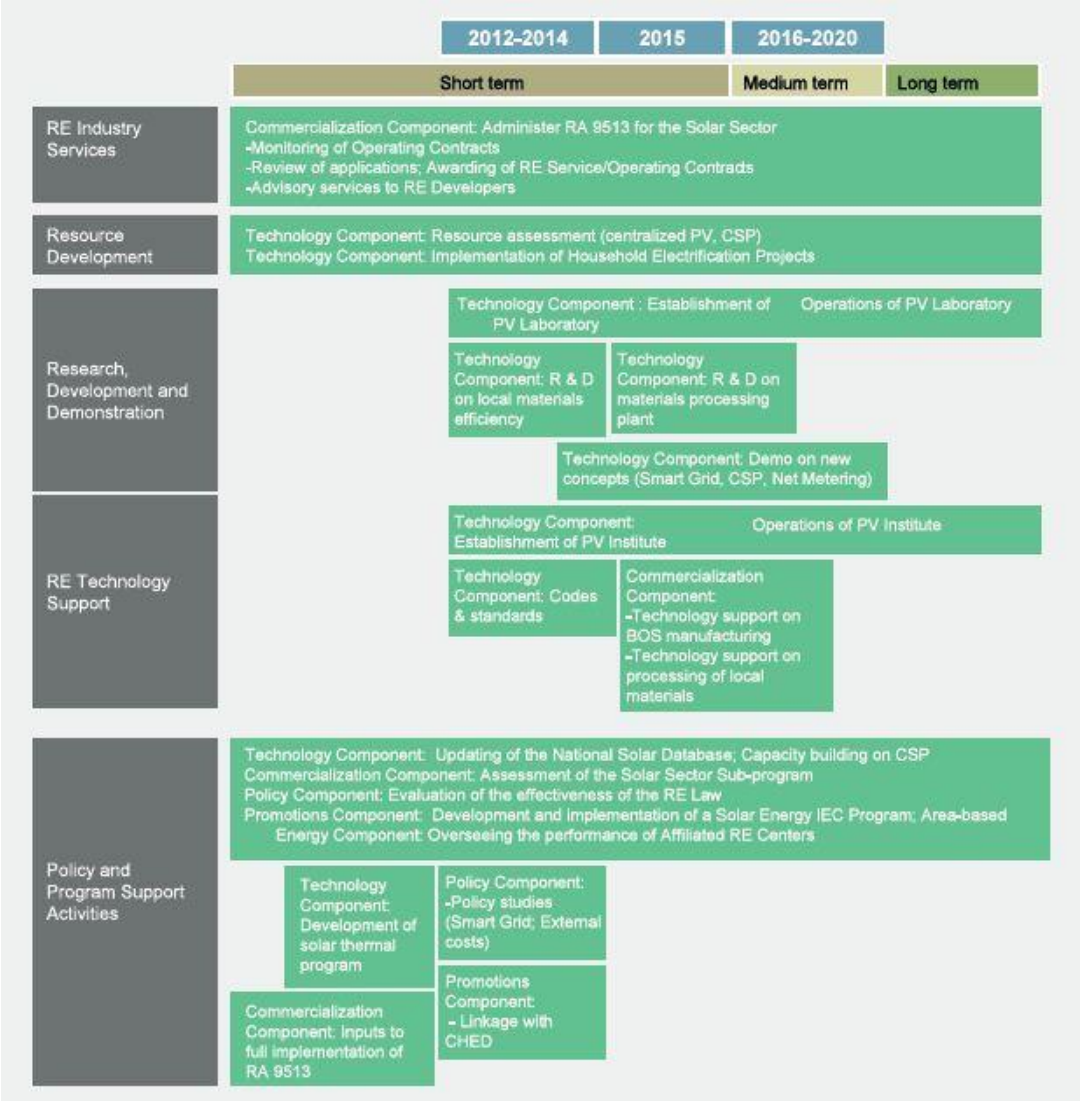
The Solar Energy Sector aims an aspirational target of additional 1,528 MW of solar power capacity, representing 3% of the country's 2010 total RE installed capacity of 5,438 MW. In setting this aspirational target, it has been noted that there are projections that solar energy will provide 5% of the global electricity consumption by 2030.

Table 12. Targeted Solar Capacity Addition (Mw), By Grid

Location	Commissioning Year				Total Capacity Addition (MW)	% Share
	2011-2015	2016-2020	2021-2025	2026-2030		
Luzon	228.05	0	0	0	228.05	80.03
Visayas	34	0	0	0	34	12.0
Mindanao	7	5	5	5	22	7.7
Total Philippines	269.05	5	5	5	284.05	100.0

The Solar Energy Sector Sub-Program (SESP) is envisioned to support the following policy thrusts of the Philippine Energy Plan: (i) ensuring energy security; (ii) pursuing effective implementation of energy sector reforms; and (iii) implementing social rnobilization and cross-sector monitoring mechanisms. Below are the scheduled activities and programs with their corresponding schedule of implementation.

Table 13. Solar Sector Sub-Program Projects & Schedule of Implementation



While the country is endowed with vast ocean resource potential, there have been very limited activities in this sector. This is primarily because of the high investment cost for its exploitation. Considering its limited resources, the government maintains a watchful eye on developments in other countries which may be applicable in the Philippines but at the same time it has kept itself open to opportunities for involvement and the development of the ocean energy sector.

A study conducted by the Mindanao State University indicated that the country, being an archipelago, has a theoretical capacity of 170,000 MW over a 1.000 sq. km ocean resource area. However the ocean power projects are still in the exploration stage. Therefore, only a minimal 70.5 MW capacity addition is expected. The Ocean Energy Sector envisions the operation of the country's first ocean energy facility by 2018.

Table 14. Targeted Ocean Capacity Addition (Mw), By Grid

Location	Commissioning Year				Total Capacity Addition (MW)	% Share
	2011-2015	2016-2010	2011-2015	2016-2010		
Luzon	0	35.5	0	0	35.3	50.4
Visayas	0	0	11	0	11	15.6
Mindanao	0	0	24	0	24	34
Total Philippines	**0**	**35.5**	**35**	**0**	**70.5**	**100**

Throughout the planning period, the DOE shall intensify efforts to assist and advise interested investors in exploration and development of the untapped ocean energy resource potential. The DOE shall keep a close watch on developments abroad to identify opportunities for technology transfer. Technology support activities, through capacity building and mentoring of sector participants' personnel as well as the establishment of standards and best practices, shall be sustained throughout the planning period (2011-2030). Program support activities, such as technical cooperation with relevant agencies, e.g., Philippine Navy, Marine Science Institute, shall likewise be continued. The sector's work program is listed in Table 15.

Table 15. Ocean Sector Work Program

Type of Activity	Work Program
RE Industry Services	1. Review of applications; endorsement for registration of applications 2. Monitoring of RE contracts 3. Advisory Services to RE Developers on: • RE policy mechanisms/guidelines • Ocean energy project packaging
Resource Development	1. Conduct of Ocean Energy Resources Inventory 2. Feasibility studies 3. Project packaging 4. Optimization of resource inventory
R, D & D	None
RE Technology Support	1. Development of local capabilities 2. Establishment of standards and best practices 3. Technology mentoring activities
Policy and Program Support-Related Activities	1. Cooperation with other government agencies e.g. Navy, Marine Science Institute, etc. 2. Capacity Building Program for DOE staff • Foreign Training • Study Tour to Ocean Energy Facilities

6.4 Investment Requirements

The targeted RE based capacity addition of 9,865.3 MW will mainly be financed and undertaken by the private sector and will entail a total investment of PhP1.2 Trillion (equivalent to around USD 26 billion). Table 16 presents the breakdown of the requirement by resource.

Of the said amount, an estimated PhP 17.2 billion, have already been committed by the private sector for the development of 124.6 MW projects in the geothermal, hydropower and biomass energy sectors. Another PhP 1.15 trillion shal1 be needed for the development of the indicative projects with an aggregate capacity 9,740.7 MW.

Table 16. Investment Requirements For Re Projects By Resource

RE Resource	Indicative Capacity (MW)	Estimated Investment Requirement (MIllion USD)	Estimated Investment Requirement (MIllion PhP)
Committed Projects			
1. Geothermal	70.0	210.0	9,450.00
2. Hydropower	27.8	69.5	3,127.50
3. Biomass	26.8	102.1	4,592.90
Sub-total	**124.6**	**381.6**	**17, 170.40**
Indicative Projects			
1. Geothermal	1,425.0	4,275.0	192,375.00
2. Hydropower	5,366.3	15,112.8	680,073.75
3. Biomass	249.9	622.4	28,010.01
4. Wind	2,345.0	4,690.0	211,050.00
5. Solar	284.0	710.1	31,955.06
6. Ocean	70.5	246.8	11,103.75
Sub-total	**9,740.7**	**25,622.1**	**1,154,792.57**
Grand Total	**9,865.3**	**26,038.7**	**1,171,737.97**

4. CLEAN DEVELOPMENT MECHANISM (CDM)

4.1. Designated National Authority (DNA)

Pursuant to Executive Order No. 192 dated 10 June 1987, the Department of Environment and Natural Resources (DENR) acts as the primary government agency responsible for the conservation, management, development, and proper use of the country's environment and natural resources.

As the Designated National Authority (DNA) for Clean Development Mechanism (CDM) in the Philippines, the DENR, in line with its mandate, supports policies and measures that protect the climate system against human-induced change, which are appropriate to the specific conditions of the State, by facilitating and promoting CDM project activities.

4.2. CDM Steering Committee

An Undersecretary of the DENR, designated by the DENR Secretary, serves as the Chair of the CDM Steering Committee, together with a named alternate. The Secretaries of the Department of Energy and the Department of Science and Technology (DOST) have likewise designated an Undersecretary and an alternate to represent their respective departments in the Steering Committee. One representative each from the Philippine Chamber of Commerce and Industry and the Philippine Network on Climate Change also serve as members in behalf of the private sector and nongovernmental organizations, respectively.

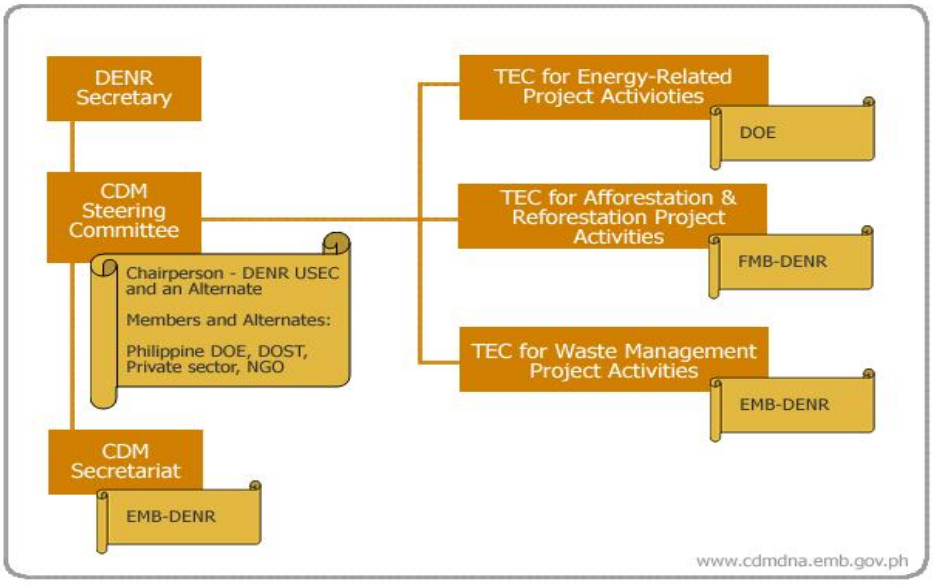


Figure 7. DNA Organizational Structure

4.3. CDM Updates

As of September 2012, new (61) Letter of Application (LOA) for 4177 CDM project activities have been signed and issued bringing to a total of 112 LOAs. These comprise 44 large scale waste management project activity and 68 small scale waste management and energy-related project activities.

PART 2: Review Team Report

This part of the report presents the PRLCE Team's conclusions and recommendations about low carbon energy policies and programs in the Philippines.

1. INSTITUTIONAL CONTEXT

1.1 Critique

The Philippines has well-established legal framework and government related institutions in charge of promoting and in introducing renewable energy (RE). Specifically, the legal framework for promoting RE is supplied by the "Renewable Energy Act" (RE Act) of 2008.

By virtue of the RE Act of 2008, the Renewable Energy Management Bureau in the Department of Energy (DOE-REMB) was created to be the dedicated unit for RE promotion and development in the Philippines. Relevant governmental offices are involved in the promotion of RE, including the attached agencies of DOE, namely, National Power Corporation (NPC), a state-owned company, and National Electrification Administration (NEA) among others. Relatedly, the Energy Policy and Planning Bureau of DOE (DOE-EPPB) plays a pivotal role in coordinating policies of DOE-REMB and relevant governmental offices mentioned above.

The Energy Regulatory Commission (ERC) enforces the rules and regulations governing the operations and activities of the Wholesale Electricity Spot Market (WESM) in order to ensure supply expansion and rational pricing of electricity

The National Renewable Energy Board (NREB)[2] is also created by virtue of RE Act of 2008 and dedicated to advisory and monitoring function. NREB involves not only governmental but also private stakeholders, thus making itself as an independent and neutral body within the Government. (further discussion can be found on "Regulation and Infrastructure" part)

It is also noteworthy that RE industries in the Philippines are well-organized for representing their stakes, especially in policy making.

Under these circumstances, incentives for RE development, such as Feed-in Tariff (FIT), tax incentives and government bank loans, have already been established. Meanwhile, formulation of the Renewables Portfolio Standard (RPS) is ongoing which will be introduced soon.

1.2 Recommendations

Recommendation 1

Regulatory procedures for RE development should be less time-consuming.

While introduction and development of RE inevitably entails various permission or authorization by the central and local governments, such regulatory procedures are not streamlined and therefore very time-consuming. Hence, in order not to discourage RE developers, the government

[2] Philippine Department of Energy website (http://www.doe.gov.ph/ER/Renenergy.htm

should review its regulatory procedures to shorten the time usually spent in processing the documents required from RE developers.

Recommendation 2

It may be worthwhile to reinforce the policy formulation function of REMB for RE, in collaboration with EPPB which is the policy formulation group of the DOE, to increase feedback from policy implementation to policy formulation at the implementation of RE development proceeds.

As REMB is a relatively new bureau within the DOE, EPPB is assisting REMB in policy formation. Not in far future, REMB is expected to be a full-fledged bureau in the Department and become responsible for all aspects of RE policy.

Recommendation 3

It may also be worthwhile to reconsider the composition of NREB to make governmental and private members in equal number, thus giving the independent chairperson a casting vote, which will give more voice to the private sector and enhance the neutrality of NREB.

The Government occupies 8 seats within the 15 members of NREB and always secures the majority of the Board. The remaining 7 slots seats were occupied by members from the private sector including the chairperson. Even with the consent of the chairperson, the private sector cannot overcome the opposition of the Government in a possible situation where the interests of the Government and the private sector are contradictory. Therefore, it may be advantageous to consider making the governmental and private members in equal number at the composition of NREB to give the independent chairperson a casting vote. The change in the composition of the members will likely enhance the independence and neutrality of NREB.

2. RENEWABLE ENERGY GOALS, TARGETS AND STRATEGY

2.1. Critique

2.1.1 Goals and Targets

Transformational goals in energy security, sustainability and socio-economic development have been established via the RE Act of 2008 (Republic Act 9513) and the Biofuels Act of 2006 (Republic Act 9367). The Electric Power Industry Reform (EPIRA) Act of 2001 (Republic Act No. 9136) has assisted in the provision of renewable electricity supply to missionary areas. The Climate Change Act of 2009 (Republic Act 9729) which initiated the establishment of the Climate Change Commission also provides impetus to the RE agenda in its role in mitigating the causes and effects of climate change.

The goals of the RE Act of 2008 and the Biofuels Act of 2006 are shown in Table 2.1.

Table 2.1. Legislative goals of the RE Act of 2008 and the Biofuels Act 2006.

Renewable Energy Act of 2008	Biofuels Act 2006
• Accelerate the development of renewable resources.	• Develop and utilize indigenous renewable and sustainably-sourced clean energy sources to reduce dependence on imported oil.
• Provide fiscal and other incentives for the efficient and cost-effective commercial development of RE systems.	• Mitigate toxic and greenhouse gas emissions.
• Support economic growth and development with energy generation systems that minimize impacts on health and the environment.	• Increase rural employment and income
• Establish the infrastructure to facilitate the previous goals.	• Ensure the availability of alternative and renewable clean energy without any detriment to the natural ecosystem, biodiversity and food reserves of the country.

In order to achieve effective implementation, goals need to have a balanced cross-sector focus. The goals outlined in Table 2.1 emphasize accelerated implementation with infrastructure support in association with mitigating environmental effects and improving socio-economic conditions. This broad focus provides a robust platform on which to develop credible strategies.

Effective implementation plans are critical to achieving legislative goals. The goals expressed in the legislation are well supported by the Philippine Energy Plan 2012-2030 (PEP 2012-2030); the National Renewable Energy Plans and Program (NREP) 2011-2030; the National Biofuels Program (NBP); the National Energy Efficiency and Conservation Program (NEECP); the 2012-2016 Missionary Electrification Development Plan (MEDP), the Clean Development Mechanism (CDM) and other sector specific plans. The goals for the PEP 2012-2030; the NREP 2011-2030; and the NEECP are shown in Table 2.2.

Table 2.2 Planning goals of the PEP, the NEECP, the NREP and MEDP.

Philippines Energy Plan	National Energy Efficiency and Conservation Program
• Ensure energy security	• Reduce the impact of the increase in prices of petroleum products and electricity through the implementation of energy efficiency and conservation measures.

• Pursue effective implementation of energy sector reforms • Implement social mobilization and cross-sector monitoring mechanisms.	• Promote cost avoidance/savings for fuel and electricity without sacrificing productivity. • Help protect the environment. • Generate cumulative energy savings for the planning period 2007–14 of 9.08 million bfoe, which equates to a deferred megawatt capacity of 211 MW and greenhouse gas (GHG) emissions of 2917 kt (Gg) of CO_2 by 2030.
National Renewable Energy Plans and Program	**Missionary Electrification Development Plan**
• Institutionalize a comprehensive approach to accelerate the applications of RE technologies in a sustainable manner. • Implement action plans to encourage investment. • Develop a sustainable energy system	• Ensure the quality, reliability, security, and affordability of the supply of electric power. • Minimize of nationwide Universal Charge for Missionary Electrification • Improve supply reliability.

2.1.2 Strategies

The plans contain comprehensive strategies as a means to achieve the ambitious goals. The PEP contains 16 strategies relevant to RE, the NREP contains three strategies and the NEECP contains four strategies as shown in Table 2.3. These strategies together address issues concerning infrastructure provision, governance, information dissemination, administration and the financial climate.

Table 2.3. Strategies of the PEP, the NEECP, and the NREP.

Philippine Energy Plan	National Renewable Energy Plans and Program
• Accelerate the exploration and development of oil, gas and coal resources • Intensify development and utilization of renewable and environment-friendly alternative energy resources/technologies • Establish cross-sector monitoring mechanism in cooperation with other national government agencies, academe, local government units, non-government organizations and other local and international organizations.	• Policy and Program support is to be provided by a "One Stop Shop". • Information services will provide key resource, price and market information to enable developers to assess project viability. • A Monitoring and Evaluation Unit will monitor progress on achieving the goals of the RE Act and the NREP.

- Attain nationwide electrification
- Put in place long-term reliable power supply
- Improve transmission and distribution systems
- Secure vital energy infrastructure and facilities
- Maintain a competitive energy investment climate
- Pursue effective implementation of energy sector reforms
- Monitor the implementation of, and if necessary, recommend amendments to existing energy laws

National Energy Efficiency and Conservation Program

- Information, education and communication campaigns.
- Voluntary agreements.
- Energy labelling and efficiency standards for household appliances.
- The Energy Management Program.
- Promote an efficient, competitive, transparent and reliable energy sector
- Advocate the passage of new and necessary laws
- Implement social mobilization and cross-sector monitoring mechanisms
- Expand reach through Information, Education and Communication
- Enhance energy efficiency and conservation
- Promote good governance

The NREP 2011-2030 specifies an increased renewable generation of 181% by 2030. Other examples of the ambitious targets are the Household Electrification Program that targets 90% of households being electrified by 2017 and the National Biofuel Program that targets 20% blends of both bioethanol and biodiesel in 2030 with E85 also available by 2030.

Key elements in achieving the targets are the development of human resource capability; availability of finance, accurate and readily available resource assessment information, efficient and transparent allocation of resource development rights, comprehensive information dissemination, and robust monitoring. The establishment of the NREB and the National Biofuels Board are important vehicles to mobilize expertise for the purpose of facilitating the implementation and monitoring of the plans. The CDM of the United Nations Framework Convention on Climate Change (UNFCCC) which is administered by the Department for the Environment and Natural Resources (DENR) is also a key element in promoting low carbon technologies by, inter alia, facilitating and promoting sustainable use of natural resources and alleviating poverty. As of June 2012 58 CDM projects had been registered resulting in emission reductions of 2.3 Mt-CO_{2eq}/y.

2.2. Recommendations

Recommendation 4

The NREP; the National Biofuels Program; the NEECP and other energy related plans and programs should be harmonized and the updated copies be posted in a single website location. The plans should each quote the aims of the relevant legislation that they are seeking to fulfill.

Developers will be assisted by a consolidated website location where they can understand the full landscape of government policy.

Recommendation 5

Implement a review in processing of documents to reduce the costs to developers in obtaining consents, permits and licenses.

Currently over 40 formal permissions may be required before construction of a renewable resource based project can commence. These include statutory consents and other permits from government departments, barangays, sitios, local residents' councils, and financial institutions. Actions to reduce the number of permissions and substantially reduce the timeframe to obtain consents could include legislative reform, improved process facilitation (One Stop Shop), and increased DOE staff resourcing.

Recommendation 6

Implement broad scope multi-regional techno-economic modeling of the Philippines energy and agricultural economies to provide more certainty on future targets and investment strategies.

The setting of effective RE targets requires a sound platform of scientific information from which the potential of RE generation can be estimated. The existing modeling work will be enhanced with a structured plan to extend the scope of models of primary energy resource and land use. For instance a model of the potential use of energy resources should include competing sectors in electricity generation, alternative fuels production, and industrial processing. Model outputs should include long term electricity prices, biofuel prices, vehicle fleet profiles and environmental and health related externalities at a multi-regional level. A range of scenarios can then be developed and progressively modified as further information on resource use becomes available.

Recommendation 7

Set and monitor the penetration of national RE goals into barangay[3] plans and where relevant sitio[4] plans.

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[3] Barangay - a village, district or ward, the smallest political subdivision in the Philippines.

[4] Sitio – a territorial enclave that forms part of a barangay

The level of regional and local government awareness of central government low-carbon energy policy will be an important factor in establishing vision for a sustainable low-carbon future at a local level. This recommendation is a prerequisite for rapid and low-conflict development of resources.

Recommendation 8

Provide more technical standards along with an Information Education and Communication campaign to enhance adoption of sustainable technologies.

The provision of technical standards will provide a base of sound technical guidance to those entering the renewables sector and thereby enhance human resource capability.

3. REGULATION AND INFRASTRUCTURE

3.1 Critique

3.1.1 Regulation

As previously mentioned, the RE Act of 2008 which was signed into law last December 16, 2008, affirms the government's commitment to accelerate the exploration and development of RE resources. It also mandates the development of a "strategic program" to increase RE usage. Further to its benefits, the RE Act will try to address possible bureaucratic constraints in developing RE by streamlining the registration process and promoting transparency and open competition. Future policy requirements to commercialize RE, such as the formulation of a feed in tariff (FIT) and bidding for its allocation, are submitted to ERC and were approved with revisions.

While the DOE as mandated by the Law, led the formulation of RE plans and programs in consultation with its stakeholders, the NREB serves as its guiding arm when deemed necessary. As discussed earlier, the NREB is composed of representatives from the energy sector as well as its stakeholders. The Board served as an advisory body and has no corporate powers. Generally, its main function is to review, evaluate and recommend DOE the mandated RPS and minimum RE generation capacities in off-grid areas as deemed appropriate. Specifically, the NREB also 1) Recommends tariff level for Fit; 2) Recommends and implements the NREP and 3) Enforces and supervises the "Renewable Energy Trust Fund" (for application in research and development of renewable energy).[6]

The enactment of Republic Act No. 9136, otherwise known as the EPIRA of 2001 abolished the then Energy Regulatory Board (ERB) and created in its place the Energy Regulatory Commission (ERC) which is a purely independent regulatory body performing the combined quasi-judicial,

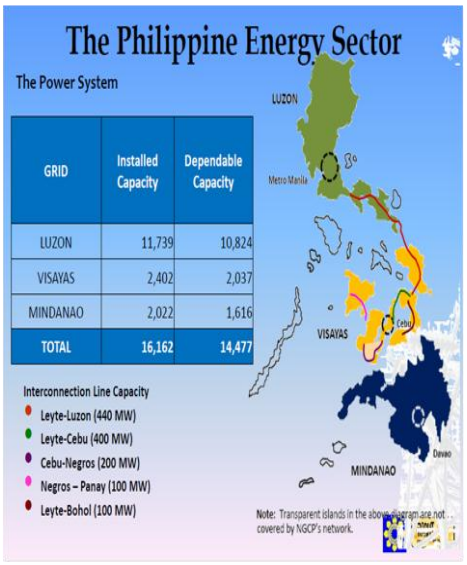
[6] http://www.doe.gov.ph/nrep/index.asp;

quasi-legislative and administrative functions in the electric industry. In addition, since the Philippine oil industry was fully deregulated, ERB's focus of responsibility centered on the electric industry. Worth noting also was the Act specifies preferential treatment on RE projects. In addition, in collaboration with NREB, ERC will review the tariffs based on NREB's report on the state of RE development and the impact of FIT (*full discussion will be found on the "Power Supply System-Smart Grid, FIT, Private Participation" part of the report*).

While DOE has accomplished majority of its goals since the passage of RE Act of 2008, the Review Team found some room for further improvement. The tedious process of permitting and processing of necessary documents were one of the biggest challenges hampering the implementation of RE projects. While this constraint could not be a technical matter, most RE developers' projects however, were experiencing a lot of delays in view of this issue.

3.1.2 Infrastructure

Due to its geographical structure, the economy has a complex energy system. Major power grids are separated according to its three major islands, Luzon, Visayas and Mindanao. In the Luzon grid, more than half of its capacity is coal-fired; Visayas is home to the economy's vast geothermal resources; while more than 50% of the Mindanao grid's energy requirement is sourced from hydro. To fully connect the entire economy to the national grid is a natural hurdle, adding to the fact that the most remote and disperse and more difficult to electrify rural areas require intensive resources, time and efforts. Hence smaller islands are interconnected to the major island grids to provide service to remote areas. Where it is not economical to connect a small island to a major grid, separate local systems are being established around small generating plants.



PEP 2012-2030 presentation by Dir. JT Tamang during the PRLCE in the Philippines (19-23 November 2012)

The government through DOE and other private and government agencies spearheads the development of various innovative service delivery mechanisms towards achieving greater access to electricity services. One of its efforts is the "Expanded Rural Electrification Program" (ER Program) which aims to at least provide the marginalized and other off-grid areas some access to electricity, through decentralize energy system such as battery charging stations (BCS) or individual Solar Home System, micro-hydro systems and wind turbine energy systems.

Cross country/difficult terrains

The National Electrification Administration (NEA), an attached agency of the DOE, is the economy's prime mover in rural electrification and the DOE's arm in the implementation of the decentralized energy systems. As part of its initiatives for RE program, NEA implements the Barangay Line Enhancement (BLEP) which consists of re-energization of previously energy barangays through off-grid technologies (such as solar home system and stand alone genset) currently supervises 96 electric cooperatives by providing quality financial, institutional and technical services to franchise areas not covered by the Manila Electric Company, the economy's biggest privately-owned utility. NEA faced a lot of challenges in implementing BLEP and as mentioned earlier, in view of the economy's geographical system, implementation of BLEP encounters delay and adversities in view of the economy's cross and difficult terrain.

The restructuring of the energy sector calls for the separation of the different components of the power sector namely, generation, transmission, distribution and supply.

The NPC remains as an economy-wide government-owned and controlled corporation which performs the missionary[7] electrification function through the Small Power Utilities Group (SPUG). SPUG is responsible for providing power generation and its associated power delivery systems in areas not connected to the transmission system. NPC assists DOE in the preparation of MEDP and the continual assessment of areas for commercial viability as well as in championing RE application in missionary areas.

Meanwhile, the transmission component which is now privatized is owned by the National Grid Corporation of the Philippines (NGCP). The NGCP likewise has comprehensive plans for the grid connection for new RE power plants, however mostly are those areas within the grid. While there are some plans for off-grid areas, the RE developer should take the lead in constructing the transmission connections. The NGCP has a "wait and see first" policy before a major interconnection is

[7] Provision of basic electricity service in Unviable Areas with the ultimate aim of bringing the operations in these areas to viability levels (RA 9136-IRR, p. 66)

undertaken, which means that unless the transmission in a particular area is ready, NGCP will not carry on with the interconnection to the grid.

The government has also comprehensive loan packages available for various projects needing financial assistance from both the private and public financing institutions. The Land Bank of the Philippines (LBP) and Development Bank of the Philippines (DBP), both government financing institutions (GFIs), as well as the Banco de Oro (BDO) a private bank, offer attractive loan packages for RE-related projects as well as Overseas Development Assistance (ODA) to augment funding requirement of RE-related projects. Albeit the loan facilities offered by these banks however, project developers still find difficulty in securing financing due to high riskiness and high upfront cost of RE projects.

3.2 Recommendations

Recommendation 9

The Team found it necessary for a Ministerial level action which will establish a Ministerial decision (action plans) to address the issue on tedious processing of document which will also consequently achieve the government's goal of good governance;(this recommendation is on top of the recommendation given in "Goals and Strategies" part which generally aimed at reducing cost incurred by RE developers in processing the required documents)

During the peer review, RE developers cited the challenges they are facing which were mostly on the tedious processing of document and other permitting requirement. Hence, should there be Ministerial talks and action plans among the agencies involved; they could come up with effective solutions to this issue.

Recommendation 10

In addition to the issue on the tedious processing of document, it is recommended to develop a database of requirements, (e.g. Checklist, best practices, etc,) where the entire relevant government agency as well as RE developers can look for reference to avoid duplication of requirement and hence, facilitate processing;

Consequently with the action plans for the processing of document, it would be best to maintain a data base of the entire requirement, that will counter check for requirement duplication as well as gives detail on the procedure of processing thus saving processing time.

Recommendation 11

Develop a comprehensive Information Campaign Plan (regulatory and statutory requirements) that would include those in the local government and the general public;

Unawareness of important information would normally cause conflict. A comprehensive information campaign plans for both regulatory and statutory bodies would possibly lessen difficulties

facing the processing of document once the concerned is knowledgeable on the relevance of the project.

Recommendation 12

Monitoring and evaluation of project-related activities should continue even after the project has been implemented;

Constant monitoring of a project being implemented even small ones would provide project developers and investors something to consider for future investment. Recording all the best practices as well as challenges experienced would somehow provide project implementors groundwork for future projects.

Recommendation 13

Maximize the application of GFI's comprehensive loan packages, especially on capacity enhancement;

Given that RE projects have high investment cost, the least a developer could do is to maximize the facilities offered by financing institutions, especially the capacity enhancement they would provide for the project developers. In addition, learning from each other by continuous dialogue and sharing of information between the financing organization and developer would probably mutually benefit them.

Recommendation 14

Need to review RE Law to give more attention to off-grid RE issues; The DOE, RE developers and NGCP should continue its coordination and dialogues to address transmission/grid issues;

There would be a need to further review the RE Law and the Implementing Rules Regulations to give more attention to off-grid issues. Many developers are interested to invest in putting up RE projects sans the various challenges facing in off grid areas, such as transmission and interconnections. Given the geographical structure of the economy and with the NGCP's "wait and see policy", it will be difficult to identify whose part of jurisdiction needs to be addressed, the developers or the government. Hence, it would be best if a constant dialogue will be undertaken to come up with the better solution to which entity would address the problem, and then specify them accordingly in the rules and regulations.

4. BIOFUELS AND BIOMASS ENERGY

4.1 Critique

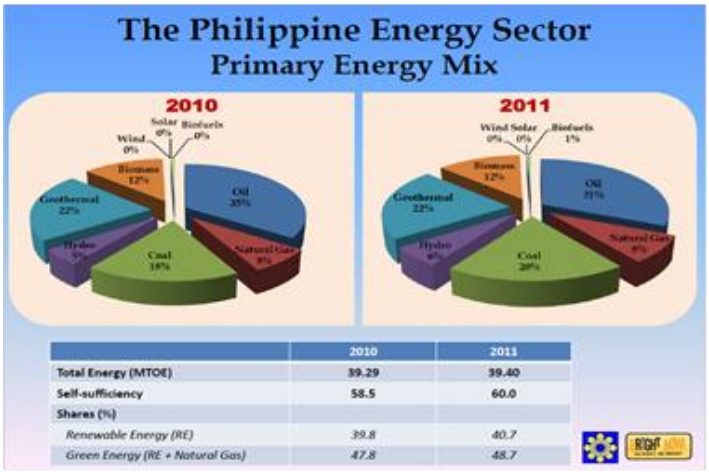
The Philippines' biofuels feedstock is currently produced from its indigenous resources, such as but not limited to sugar cane and coconut. As mandated by Biofuels Act of 2006 diesel and gasoline sold to the public nationwide should be blended with 2% coco methyl ester (CME also known as

biodiesel which initially was 1% blend) and 10% ethanol (initially at 5%), respectively (a.k.a. B2 and E10).

Biofuels resources

Biomass power plant

The economy likewise produces substantial volumes of waste residues or biomass which could be utilized as fuel both for power generation and non-power (from bagasse) and biogas production (from waste matter). However, this substantial potential, biomass utilization in the economy is mostly for non-power applications, such as biofuels in the transport sector, fuelwood in the household and commercial sectors and waste residues in agro-industries. (Figure 4.1) Meanwhile, the share of biomass to the economy's power generation mix is very minimal with a total capacity of only 30 MW. Current technologies employed in biomass sources are transesterification[8] (biodiesel), fermentation/distillation (bioethanol) combustion, combined heat and power (CHP), gasification, anaerobic digestion (biodigesters) and waste-to-energy conversion (methane capture from landfills)



Source: Presentation of Dir.J. T. Tamang during the PRLCE in the Philippines (19-23 November 2013)

Figure 4 .1: Primary Energy Mix, 2010-2011

The economy has also clear goals in its Biofuels Development Program. It may be worthy to note that the government trough DOE has future plans for 2nd and 3rd generation biofuels technologies which can improve yield and efficiency. The feedstock supply and biofuels demand projections were based on a comprehensive land use assessment. The economy has plans for broadening the coverage of the Biofuels Program and look for other possible feedstocks such as techno-economic studies on algae as potential biodiesel feedstocks and the use of cellulosic technologies for the production of bioethanol. The plan also include capability enhancement on land use, feedstock supply, standards, pricing, infrastructure, investment, incentive, etc.

[8] A chemical reaction (transesterification and esterification) which produces biofuel, biodiesel through biofuels process. This involves vegetable or animal fats and oils being reacted with short-chain alcohols (typically methanol or ethanol.

4.2 Recommendations

Recommendation 15

Government biofuels stockpiles should be set in order to prevent shortage;

Clearly, biofuels production depends on bio resources, which are available on a seasonal basis, hence the economy should have comprehensive feedstocks plans to prevent shortage.

Recommendation 16

More R&D should be undertaken to support the domestic uptake of biofuels;

Comprehensive resource assessment is needed to support effective planning and implementation of the NBP;

Recommendation 17

Upgrading of the existing biomass power plant (i.e sugar industry) should be supported;

Biomass can be considered as one of the reliable energy sources for electricity generation, thus the economy could learn more from its existing biomass power plant, hence the government should support its upgrading.

Recommendation 18

Small and medium size biogas technology for rural areas should be implemented since it can be an alternative sustainable energy source;

Recommendation 19

Renewable Heat Incentives (RHI) should be introduced support RE as an alternative source of heat, including cogeneration.

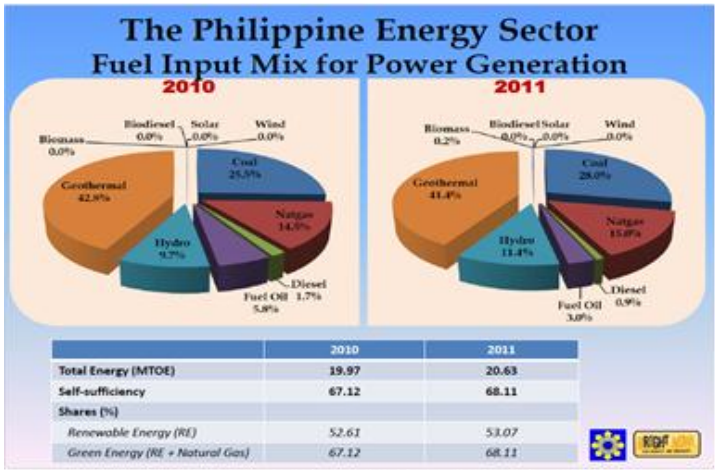
5. GEOTHERMAL, SOLAR AND WIND ENERGY

5.1 Critique

5.1.1 Geothermal

Since 1964, the Philippines has developed geothermal energy as one of the major energy sources. The first pilot plant was installed in 1967. In 2011, the installed capacity of geothermal generation stood at 1 902.69 MWe and the share of geothermal generation in the economy's power generation mix is at 41%. At present, geothermal is the largest power source of the economy (Figure 5.1).

Tongonan 1 Geothermal Power Plant, Leyte



Source : Presentation of Dir.J. T. Tamang during the PRLCE in the Philippines (19-23 November 2013)

Figure 5.1 Power Generation Mix, 200-2011

The NREP 2011-2030 shows the targets of each RE source of the Philippines. Specifically, the programme targeted a 1 495 MW additional installation of geothermal energy towards 2030.

As mentioned in previous chapters, the RE Act of 2008 promotes the development, utilization and commercialization of RE resources. Geothermal is the banner resource in the campaign for the Act. Likewise, the Act provides for the legal, institutional and financial infrastructures for developing and deploying geothermal energy. Further, under the Act, the government is tasked in developing the guidelines for Renewable Portfolio Standard, Net Metering, Feed-in Tariff Rates for geothermal and Renewable Energy Financial Programme.

Meanwhile, most of the potential high enthalpy sites have been developed for power generation, however there are also potential to develop for low enthalpy geothermal sites.

Non-electricity applications of geothermal energy have a great potential to use low enthalpy geothermal site and examples of it are district heating, greenhouse temperature control and balneology.

The National Power Corporation (NPC), a state-owned power corporation used to own the MakBan geothermal facilities, however after its privatization the plant is now owned by the Aboitiz Power Corporation. The Makban plant complex in Laguna and Batangas consists of Plants A and B with two 63-MW units each, Plant C with two 55-MW units, Plants D & E with two 20-MW units each, and a binary plant with five 3-MW and one 0.73-MW units

PRLCE Review Team during its field visit to 458-MW MakBan geothermal facilities in Luzon

The *Resource Assessment of Selected Low Enthalpy Geothermal*, a 4-year project, has been conducted to identify the factors which are needed in the development of low enthalpy geothermal resources for power generation which will also serve as template for future similar projects. The geo-scientific data from this assessment will serve as reference for further exploration and development in the future. The future development of the low enthalpy geothermal offers a variety of non-power uses such as spa and

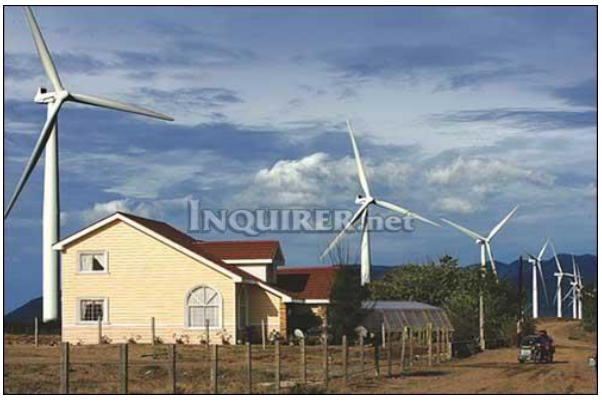
balneology for tourism, crop drying and other agricultural uses, air conditioning and refrigeration for industrial uses and possibly for power generation.

Technological challenges in the use of low enthalpy geothermal includes low enthalpy systems, enhanced geothermal systems and acid fluids.

5.1.2 Solar and Wind

1MW Photovoltaic Power Plant, Barangay Indahag, Cagayan de Oro City

In the late 1980's, Solar PV systems were introduced for the rural electrification programme of the Government of the Philippines. As the name of the programme indicates, the early stage of introducing the solar energy in the Philippines involves the electrification of rural areas. More than 30 years have passed since the introduction of the solar energy but solar PV still plays an important role to supply electricity in off grid areas. The first grid connected solar PV firm at 1 MW capacity was completed in 2008



FIRST WIND FARM IN SOUTHEAST ASIA: A 25-MW wind turbine power plant of the Northwind Development Corp. in Barangay Baruyan, Bangui, Ilocos Norte

Even though there were 2 major studies on potential sites of wind energy (Conducted in 1999 by the National Renewable Energy Laboratory and in 2003 by the World Wildlife Fund), there are not so many wind power farms in the economy. The first Wind farm in Northern Luzon at 33MW capacity was installed in 2005 (initially at 25MW).

In 2011, the share of solar and wind power generation is less than 1% of the total power supply in the Philippines (see Figure 5.1).

Target for additional capacities towards 2030 of Solar and Wind energy in the NREP 2011-2030 are 350MW and 2,345MW, respectively. The RE Act 2008 however, does not mention anything about solar energy development in the off-grid areas even though small isolated solar PV systems have historically been installed in rural areas.

In July 2012, the Feed-in -Tariff rates are fixed. The FIT rate of solar is PhP9.68 (USD 24.2¢) and that of wind is PhP8.53 (USD 23.3¢). However, the FIT Eligibility Criteria as well as the Guideline of Renewable Portfolio Standards (RPS) has not been completed while the rules enabling Net Metering

system for RE was endorsed by NREB to ERC and review is currently on-going. Most RE developers considered FIT rate for Solar low and in addition, there is no incentive for off-grid areas indicated in RE Act.

As way forward in the development of Solar and Wind energy, the assessment of the potential sites for solar power is under preparation while the conduct of wind resource assessment (on-shore and off-shore) for wind power is continuing.

5.2 Recommendations

5.2.1 Geothermal)

Recommendation 20

Enhance the promotion of non-power applications of geothermal energy.

The Philippines has a long history and experience in the development of geothermal energy but the central role of the geothermal energy in the Philippines is for electricity generation. It is worthy to explore the potential of geothermal energy to be developed for non-power applications.

Recommendation 21

Develop incentives to encourage the use of low enthalpy geothermal energy in rural areas (e.g. FIT for low enthalpy geothermal).

Most of the high enthalpy or high temperature sites of the economy have already been developed. However, there are also low enthalpy geothermal sites potential for infrastructure development, specifically in rural areas. Introducing incentives for low enthalpy geothermal will be crucial in accelerating its development.

Recommendation 22

Accelerate the use of low enthalpy geothermal energy in rural areas (e.g. off grid areas) by developing value-added geothermal facilities which produce both heat and power for industry, commercial and household sector use, especially in remote areas.

Even though almost all of the possible high enthalpy/temperature geothermal sites in the Philippines have been developed, the potential for further development of geothermal in the economy is still high. Especially in rural areas where there is small electricity or heat distribution system or possibly no electricity at all, there is a high potential to use low enthalpy geothermal energy not only as a power source but for heating purposes for industries and commercial use as well as households.

5.2.2 Solar and Wind

Recommendation 23

Set the target for the development of solar and wind for off-grid areas and roof-top solar PV, as well as start creating official statistics for solar and wind;

The targets of the additional capacity of solar and wind power generation in the NREP 2011-2030 are 284.05MW and 2,345MW respectively, but the target indicated for solar is only for the grid connected solar power generation. There is no target set for off-grid solar power generation. In addition, even in urban areas, there is no available official statistics and target for roof-top solar PV. The lack of statistical information for solar and wind energy, specifically for off-grid areas should be addressed as soon as possible.

Recommendation 24

Accelerate the process of finaliing the RPS guideline;

While the RE Act 2008 has set the legislative infrastructure in the deployment of solar and wind power generation, the RPS will serve as the motivation for accelerating the deployment of solar and wind energy.

Recommendation 25

The government should increase its efforts in the assessment of potential sites for wind power while assessment of potential sites for solar energy utilization should be underway;

The Philippines has been conducting assessment of potential sites for wind power however, similar assessment of potential sites for solar power has yet to start. These assessments will be very helpful in predicting the possibility of the development of new sites and in further improvement for existing sites as well to possibly avoid potential risks usually involved in the development

Recommendation 26

Reduce the peak demand in urban areas and improve access to electricity in rural areas by accelerating the development of roof-top solar PV. (Introduce incentives for accelerating its development.)

It is difficult to see how the roof-top solar has contributed or will contribute to meet the demand of energy because there is no official statistics of roof-top solar PV. There is potential to deploy roof-top solar PV both in rural and urban areas, hence incentives for pushing the deployment of roof-top solar PV are needed.

Recommendation 27

To secure the stable deployment of solar and wind power, accelerate the development of the net metering system, which can be part of the smart grid programme;

The Philippines is preparing for introducing the net metering system but the rules for implementing the system has not yet been finalized. The net metering system is vital for the development of a smart grid system, especially in the development of solar system in urban areas, the system would be a very important incentive.

Recommendation 28

Leading organizations in solar and wind energy development or deployment face several challenges such as the lack of capable human resources. Securing a sufficient number of staff is critical in achieving targets for 2030.

The development plans for RE are well prepared and the targets set are not so ambitious but one of the biggest challenges is in securing the human resources, especially in the Government.

6. HYDRO POWER ENERGY

6.1 Critique

Ambuklao and Binga Hydropower Plant Project

The economy has matured experience in large scale hydropower technology and hydro is one of the earliest RE sources developed in the Philippines. Electricity generation from hydro sources as well as hydro for non-power applications (e.g millings) in rural communities have started in the early 1900s.

As has been discussed in previous chapters, the economy has detailed plans for RE development which includes plans for the development of hydro power. Its targets and programs were indicated in the economy's NREP 2010-2030, specifically in the Hydropower Roadmap 2011-2030.

Power generation mix indicated that hydropower is the economy's 4th largest electricity resource in 2011 (See Figure 5.1). One of the economy's major islands, the Mindanao is the major source of hydropower in the Philippines, however as discussed in *Infrastructure* chapter, the island is not connected to any of the economy's major islands.

However, it is worthy to note that hydropower resources of the economy has the biggest number of projects awarded and potential capacity assessed at the implementation of RE Act. From the 288

PRLCE Review team during the field visit to 188 kW Villa Escudero Hydro Plant (San Pablo, Quezon Province)

The 188 KW mini-hydro (75 KW, 38 KW and 75 KW units) is a run-off river type which provides Villa Escudero resort's own electricity requirement and its plantation.

service contracts awarded (Grid use only) 160 are for hydropower with a total potential capacity of 2 588 MW. (Table 6.1) and there are about 123 hydropower project applications still pending awarding of contract.

Table 6.1 Service Contracts awarded as of October 2012

Resource	No. of projects	Potential capacity (MW)
Hydropower	**160**	**2588.06**
Ocean energy	3	5.00
Geothermal	33	785.00
Wind	38	1569.00
Solar	27	387.715
Biomass	27	186.30
total	288	5521.075

Source : Mr. R. Sargento's presentation during PRLCE (19-23 November 2012)

6.2 Recommendations

Recommendation 29

Promotion of multi-scale hydro power supply system's especially in the remote areas;

Hydropower is a mature technology in Philippines and the economy has a lot of experience in hydropower projects. Government should promote the small hydro power project especially in the remote areas, which could help decrease the substation and transmission losses.

Recommendation 30

Detailed assessment and publication of water resource distribution;

For the environmental protection consideration, the government should make a detailed guideline or code to assess the environment impact before building new hydropower project. Water resource distribution is a vital guide for consultants to develop new projects, hence the government or the economy's research institute should make a map for the distribution of water resource in Philippines.

Recommendation 31

Increase technological research on small hydro power systems;

While mature technology for the large scale hydropower projects already exists, for the small one, the Philippines should make further research on the feasibility of the technology, the economic potential as well as its application for both power and non-power.

Recommendation 32

Accelerate the process of contract approval through better coordination among relevant agencies and institutions;

In addition to previous recommendation regarding the tedious processing of document, it is worthy to consider strengthen coordination among relevant agencies and institutions to accelerate processing hence, increasing the promotion of hydropower projects and in achieving the RE targets.

Recommendation 33

Increase training of technical personnel.

Professional consultants especially on hydropower projects are very limited in the Philippines. The research institutes of the economy could assist increasing human capability by holding regular training. This could also serve as a venue to promote hydropower projects especially in the remote areas and smaller hydropower capacities.

7. POWER SUPPLY SYSTEM: FIT, SMART GRID AND PRIVATE PARTICIPATION

7.1 Critique

A global demand for energy for both oil and gas, looks set to rise for at least the next decade, even if there is an ambitious agreement tackling the causes of global climate change in the international negotiations in Copenhagen. The growing populations and economies of developing economies are the main cause of this increase. More people will want to drive cars, and there will be increased demand for electricity for both household and industrial use.

There is growing interest in RE around the world. Since most renewable sources are intermittent in nature, it is a challenging task to integrate RE resources into the power grid infrastructure. In this grid integration, communication systems are crucial technologies, which enable the accommodation of distributed RE generation and play an extremely important role in monitoring, operating, and protecting both RE generators and power systems.

The system of power supply is one of the main mechanisms in accordance towards national energy security. There are many kinds of support programmes promoting electricity supply from renewable sources, with various names, all over the world. A feed-in tariff (FiT), standard offer contract advanced renewable tariff or RE payments is a policy mechanism designed to accelerate investment in RE technologies. It achieves this by offering long-term contracts to RE producers, typically based on the cost of generation of each technology.

Besides, the instrumentation controls devices is part of the tools to ensure operation of monitoring in a way to provide power to all steady, transient and emergency modes of operation. In

addition, to ensure normal operation, limits and conditions of safe operation, equipment availability and optimisation of working parameters.

The Philippines ERC has approved the economy's FiT for RE. The ERC accepted the NREB's methodology in calculating its proposed FiT, which takes into account the construction and operational costs of each RE technologies, the generation output or capacity factors of the RE power plants and a reasonable return on investment for plant developers.

In 2011, DOE approved a 760 MW installation target for RE projects that will qualify for FiT; 250 MW each for hydro and biomass, 200 MW for wind power, 50 MW for solar energy and 10 MW for ocean technology. Table 7.1 shows the ERC approved FiT that will apply to RE power generation projects. However, the ERC deferred the FiT for ocean thermal projects for further study and data gathering. In addition, the hydropower reservoir and geothermal supplies were not subjected to the FIT due to market competitiveness. The duration of the tariff is 20 years.

Table 7.1 ERC approved Feed-in-Tariff Rates (₱/kWh)

RE Source	Feed-in Tariff Rates
Solar	₱ 9.68 (USD 0.242)*
Wind	₱ 8.53 (USD 0.213)
Biomass	₱ 6.63 (USD 0.166)
Run-of-the-river Hydropower	₱ 5.90 (USD 0.147)

Source: Dir. M. Marasigan's presentation during PRLCE in the Philippines (19-23 November2012)

**at ₱40/USD*

An ambitious plan for power generation mix (50-50 by 2030); The Philippines is blessed with vast renewable sources of energy, viz. geothermal, mini-hydro, biomass, solar and wind. The potential RE from geothermal is enormous as Philippines is located on the Pacific Ring of fire. The potential of mini-hydro projects especially the run-of-the-river type is also huge, as the energy available from the streams of rivers in the economy has been proven to provide considerable contribution to the supply of electricity in the rural areas.

Biomass, solar and wind energy is another type of RE resource that is abundant and readily available. The NREP has been formulated to ensure energy security by targeting 50% of national power supply from RE generation by 2030. The focus of the government policies is to supplement the total energy mix by increasing the contribution of RE thereby reducing the economy's dependence on depletable fossil fuel. Over-dependence on certain fuel types is not a viable long-term option.

The Philippines' RE Policy is comprised of three main RE promotion framework for a better fuel mix to ensure sustainability, technological innovations through R&D and energy Efficiency & Conservation initiatives. These promotion frameworks are believed could stimulate the RE development towards 50:50 energy mix.

Electricity demand in the Philippines is increasing at the rate of 9% per annum[9]. This is the result of an increased rate of industrialization, urbanization and agricultural activities and through these the economy is also expected to face energy and peaking shortages. These shortages can be supplemented by RE sources. The economy has supportive policy to ensure the quality, reliability, security, and affordability of the improvement of supply reliability

As stated previously, NREB is formed as an advisory body and has no corporate powers under the RE Act of 2008, however, NREB is a good forum to link regulators, policy makers, FIs, industry players and other beneficiaries

On top of top of electrification programme and unbundling of the power sector, the economy has a plan for introduction of `smart grid' technology. If the plan are successfully implemented it will increase the operational as well technological efficiency of the power distribution network to meet the growing energy demand of Philippines in line with its fast growing GDP.

7.2 Recommendations

7.2.1 Feed-in-Tariff

Recommendation 34

Develop FiT for sub-categories of RE technologies depending on technology maturity, regional application and socio-economic conditions (e.g. solar PV for household, solar farm, commercial rooftop utilisation, etc.);

Solar PV project is a simpler technology which can be applied for all types of economy. It initially started as a stand-alone generation system applicable mostly to islands and remote places where access to national power grid would be too costly to provide. However, photovoltaic solutions are now being integrated rapidly with national power transmission network. Against the backdrop, a grid-connected photovoltaic inverter which ensures stable conversion of DC power for AC power transmission network and minimizes potential impact on national power grid are in great demand.

It is also a challenge in developing huge capacity of solar power plant known as solar farm. There could be difficulty in getting the suitable project site or may be bound by land price issues. In addition, interconnection issues may occur if the site is not located within the power connection points. Inefficient power supply would happen due to longer transmission line and will most likely make the

[9] http://wn.com/philippinesenergy;

project financially unviable due to high investment cost for interconnection and which would also diminish the revenue of sold generated power to utilities.

It may be worthwhile to have a simple programme which the public could participate in by utilizing their residential roof top as a project site. This could indirectly resolve the land matters for solar PV system beside interconnection issues. This program will also ensure more Filipinos will benefit directly from the RE Trust Fund and avoiding monopoly from big power producers. The program will also provide significant impact in terms of raising public awareness in the need for clean energy generation in the Philippines.

The category under the solar PV can be classified into four classes which will differentiate FiT rate.*1) Individual with below 4kWp capacity,* the tariff for this category will get the highest FiT rate to encourage more middle income house owner to participate in the program. This is the only RE technology that allows households and small consumers to produce and sell their own electricity, thereby achieving energy security and spurring entrepreneurship among consumers. 2) *Individual with above 4kWp up to and including 12kWp,* the target applicants are household owners with huge roof top area like a bungalow. The tariff should be lesser than the first one.

Two others categories may be introduced under the solar PV, which can be classified as non-individual, such as; *below 500kWp* and *above 500kWp up to and including 5MWp*. The potential areas that can be utilized are roof tops of the factory or warehouse. For bigger system, a common solar farm requirement is applied. The tariffs are different between these categories which will be determined by the CAPEX and OPEX of the projects, respectively.

Such programs have been implemented throughout the world such as in Japan (Japan Sunshine Rooftop Programme), Germany (German Rooftop Programme) and other countries in Europe. In addition, this program can enhance business opportunities to local service providers in the field of solar PV.

Recommendation 35

Introduce additional incentives based on technology selection and local content;

Proven technologies: Enhancing energy performance and sustaining the energy generation can be one of the key criteria in securing the energy supply. A right technology selection may give value added in solving the economy's problems e.g. using indigenous sources like municipal solid waste (MSW) as fuel; not only generating electricity but a solution to dispose the waste. In the case of solar project, by using the system as part of their building structure or materials may encourage the specific small developer (homeowners) to participate in contributing MW power and it not just rely on the big system such as solar farm which inquire a huge land area and a huge cost of investment.

Local content: This is to encourage the local expert e.g. scientists, industry players, financiers and relevant beneficiaries to take part in sharing their knowledge and grasp the opportunities to make a dynamic local economy growth. More job creation means reducing unemployment and government liability of social issues. A stimulus programmes in universities on R&D might help their invented or innovated technologies for commercialization.

7.2.2 Smart Grid

Recommendation 36

Accelerate implementation of smart grid beyond the solar sector;

Smart grid envisages providing choices to each and every customer by deciding the timing and amount of power consumption based upon the price of the power at a particular moment of time. Apart from providing choices to the consumer and motivating them to participate in the operations of the grid, it is energy efficient and accommodating all generation and storage options. Smart grid also envisages various properties for the grid like self-healing and adaptive. The suite of Smart Grid products and technologies help in maximizing system uptime, while also helping the utility to restore power to homes and businesses more quickly in the event of an outage.

Smart grid is sophisticated, digitally enhanced power systems where the use of modern communications and control technologies allows much greater robustness, efficiency and flexibility than today's power systems. A smart grid impacts all the components of a power system especially the distribution level. One subset of smart grids is smart metering / advanced metering infrastructure (AMI) etc. In a smart grid, all the various nodes need to be interconnected to share data as and where needed.

Recommendation 37

Detailed planning of transmission line installation based on associated RE resource assessment

Production of energy in centralized power plants and transmitted via transmission lines to the customers most likely incur high power losses. Distributed generation (DG) especially RE resources and energy storage systems through distributed system are very cost saving and sometimes inevitable. If these small DGs will be connected to power system and participate in energy market directly, both the distribution and energy market would have many problems with control such a high amount of information and small supplies of DGs.

There are two kinds of energy generation and distribution systems, centralized and decentralized. The concept of a centralized system is harnessing energy at a centralized centre and then redistributing the same to the surrounding wider area. Power transmission losses, high investment on

laying transmission lines and repair and maintenance are some of the challenges of the centralized power generating systems.

Decentralized energy systems emerge from small-scale systems catering to the needs of small groups of people. This is especially applicable in remote rural areas where the cost of conventional energy systems would be higher and difficult to supply. Nonconventional solar, wind and biomass energy can be harnessed locally and distributed through both centralized and decentralized systems.

7.2.3 Private Participation

Recommendation 38

Awareness programme to local government and public (not limited to government initiative also require participation from NGOs and private sectors).

In multi-sector relations, the private sector plays importance roles in further promoting effective RE measures. Bilateral contact with government and consumers which has significant potential in improving RE development should also be maximized. There is also potential in using the private sector's multilateral and bilateral activity to increase development and deployment of technologies using alternative energy sources. This will help in reducing future demand pressure on global technologies supplies thereby reducing technology prices and consequently leads to public acceptance.

Recommendation 39

Formulate a 'win-win" approach to encourage more private sector investments and participation in RE development.

Financial is one of the most common barriers in developing RE project, hence private sector participation can be enhanced through financing incentives e.g. RE Technology Financing Scheme whereby the industry players will benefit from 2% interest rate absorption that will be covered by the government and 60% government guarantee to minimize the investor risk.

Recommendation 40

There is also a need to intensify human capital development in RE industry to serve the RE industry needs via comprehensive training courses.

This is to ensure that RE installations in Philippines is done by trained and competent workers. To address the issue, a RE Training Institute should be formed to provide a specific knowledge, installation procedures and standard compliance knowhow.

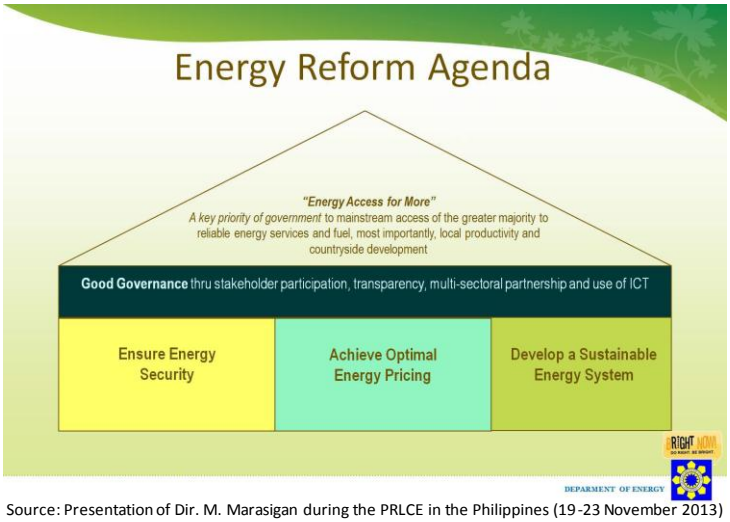
8. GREENHOUSE GAS MANAGEMENT

8.1. Critique

The mitigation of greenhouse gas (GHG) emissions is one of the critical issues in seeking sustainable economic growth and so is the Philippines. The great concern with the global warming by the Philippines is apparent from the recently enacted laws which aim to promote RE and the ratification of the Kyoto Protocol in 2003. The Philippines enacted the Biofuels Act of 2006, the RE Act in 2008 and Climate Change Act of 2009. These acts accords with "*Develop a Sustainable Energy System*" framework stipulated in the Energy Reform Agenda (ERA) of the government (Figure 8.1).

The importance of the Biofuels Act of 2006 and RE Act of 2008 for the GHG management is realized in view of the transport sector and the total energy sector's contribution to the economy's GHG emissions of 32% and 36% respectively, in 2010. This excludes GHG emissions from land use change and agriculture and forestry.

Figure 8.1 Energy Reform Agenda (SRA)



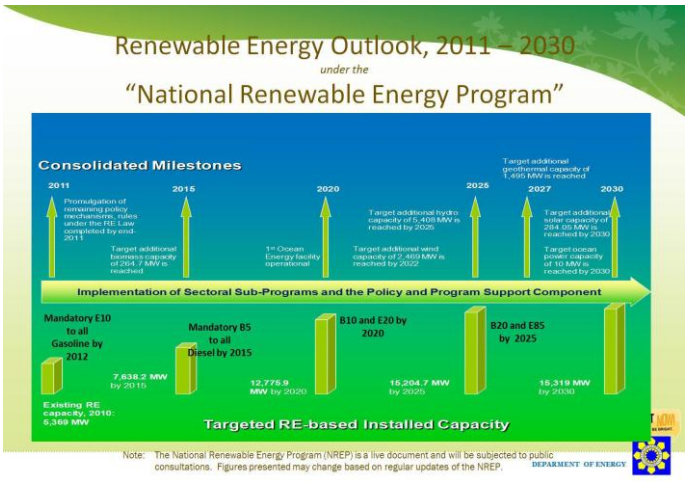
Source: Presentation of Dir. M. Marasigan during the PRLCE in the Philippines (19-23 November 2013)

The Biofuels Act of 2006 mandates the use of biodiesel and bioethanol blend gasoline (i.e., gasohol) for all vehicles. The blend policy of B2 and E10 has presently been implemented in the economy and furthermore, it targets to increase the present blend rates of B2 and E10 to B20 and E20/E85 by 2030, although E85 is not considered as a mandate so far. Under the biofuels policy, only locally produced bioethanol is utilized for gasoline blends unless there are some shortage of the local supply of bioethanol. Therefore, given the expected future economic growth of the Philippines (i.e., 4-6%) and a higher blend target, the demand for bioethanol will be predicted to increase more than the economic growth rate. Given these mere facts, the land use for feedstock supply and the energy consumption of bioethanol production are the two critical factors for the life cycle GHG emissions, that is, overall GHG emissions resulted from the production and through the consumption of biofuels.

Consequently, it is essential to increase the energy efficiency in producing bioethanol as well as to improve agricultural technology to induce a higher productivity of feedstock through the environmentally sound use of the existing and in expanding cultivated land.

The NREP under the RE Act of 2008 plans to install the additional RE capacity of 9 950MW for the period 2011-2030 to reach the capacity level of 15 319 MW by 2030, about triple to the current level of 5 369.0MW (see Figure 8.1). Although RE significantly reduces the GHG emissions as the substitute of fossil fuels, it still generates GHG emissions. The emission level depends on energy types thus, the impact of RE on the GHG emissions reduction depends on how much power will be supplied by what energy type. For the GHG emissions management, predicting GHG emissions from newly installed capacity needs to rely on the life cycle GHG emissions of energy types like the case of bioethanol. The Intergovernmental Panel on Climate Change (IPCC) provides the life cycle emission factors (i.e., CO2eq/kWh) of solar PV, commercial solar, wind, geothermal, biomass, hydro and ocean. The emission factors are indicated in the range of the values so that the choice of the value should be carefully done, that is, based on the prospecting technology of each energy type to be installed.

Figure 8.2 National Renewable Energy Program 2011-2030



Source: Presentation of Dir. M. Marasigan during the PRLCE in the Philippines (19-23 November 2013)

Some of RE projects on bioethanol production and RE such as solar, wind, geothermal, biomass and hydro have been launched by CDM. There are 58 registered CDM projects as of October 2012 and among them, about 80% of the projects are related to RE. Promoting CDM enhances the faster deployment of RE as well as in earning the potential revenues by Certified Emission Reduction (CER). CER revenues are used for the socio-economic development programs in the host community; however, the suitable allocation of CER revenues is important to sustainable development of the economy as a whole.

Climate Change Act of 2009 takes into account the adaptation and mitigation policies for climate disasters such as typhoons, flood etc. in the energy sector. The adaptation and mitigation policies under the Act are considered to be sort of an insurance policy to keep power supply unaffected by climate change.

A series of landmark laws is necessary for promoting RE which leads to the mitigation of GHG emissions. Specifically, policies being implemented or to be implemented under the RE Act of 2008, Feed-in Tariff (FIT) and RPS are geared towards this, although RE developers are still waiting

for the first kWh for RE entitled to FIT. As regards, RPS, the shares of each RE type are obliged to increase by one percent for the next ten years, but the specific implementation of RPS is still obscure. In related to this point, the laws and policies need to be properly implemented as being planned. The delay of executing policies would make the GHG emissions more difficult to manage.

8.2. Recommendations

Given the fact that the transport sector and the energy sector together contribute about 70% of GHG emissions in the Philippines, recommendations are separately given to the transport sector and the energy sector.

8.2.1 Transport Sector

Recommendation 41

Life cycle GHG emissions should be analyzed by utilizing the actual data to predict more accurate GHG emissions.

The replacement of conventional gasoline by biofuels blended expects to reduce GHG emissions. However, GHG emissions prior to the final consumption of biofuels, namely, feedstock cultivation process, bioethanol production process and manufacturing production factors such as fertilizer etc. would offset GHG emissions reduced by the replacement in vehicles. So, overall GHG emissions from cradle to grave base should be analysis to grasp more accurate condition of GHG management.

Recommendation 42

To target a higher blending rate with only locally produced bioethanol, in relation to GHG emissions, (i) relevant land use patterns such as land expansion should be examined, (ii) R&D for agricultural technology (e.g., more harvest per ha, less fertilizer application etc.) should be enhanced, and (iii) investment plans and processes should be implemented as soon as possible.

For better management of GHG emission, additional efforts to reduce the emissions should be made as long as bioethanol relies on the local production in place. The necessity of increasing feedstock supply due to the growing expected demand for bioethanol requires the expansion of cultivated land. GHG emission from land use stems from carbon stock in soil which depends on soil type, crop type, climate condition and soil management and thus, well-suited land use should be engaged. The necessity of R&D for agricultural technology arises because technological innovation leads to the reduction of both land expansion areas and the amount of fertilizer application.

To keep GHG management in the right track under the NREP, it is important to provide the circumstances in which developers will have proper incentives for RE investment without delay.

8.2.2 Energy Sector

Recommendation 43

For additionally installed RE capacity, life cycle GHG emissions factors of each energy type should be used to estimate the emissions

Like the GHG management of biofuels, it is important to realize the impact of additionally installed wind, solar, geothermal, hydro and biomass on the GHG emissions. The prediction of GHG emissions from each energy type should be based on the life cycle emissions to evaluate the net impact of RE planned to be installed.

Recommendation 44

The optimal management of the revenue earned from CERs should be examined to promote RE or reduce GHG emissions afterward

Although CERs of CDM projects given to the host economy are dependent upon the agreement between the host economy and the investors in Annex I countries under the Kyoto Protocol, there are 43 CDM projects being related to wind, solar, geothermal, hydro and biomass in the Philippines, which expect to generate about 3.7 million CERs. This would generate a fair amount of revenue so that the allocation of the revenue should be utilized not only for socio-economic development but also for advancing the implementation of RE.

Recommendation 45

Accelerate the registration procedures for applications for FIT qualification and also the joint use of FIT and RPS for RE promotion should be optimized and clarified.

The GHG management is directly linked to the installation of RE capacity. In other words, the smooth procedures in the RE capacity building are essential to reducing GHG emissions. Nonetheless, the registration procedures for FIT application are slow to date and developers are waiting for the entitlement to FIT. This slow procedure may affect the incentives for RE investment.

Meanwhile, RPS will be implemented with the FIT system. FIT and RPS provide the different risks and incentives for developers. Hence, the policy scheme for the joint use should be optimized for RE promotion.

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