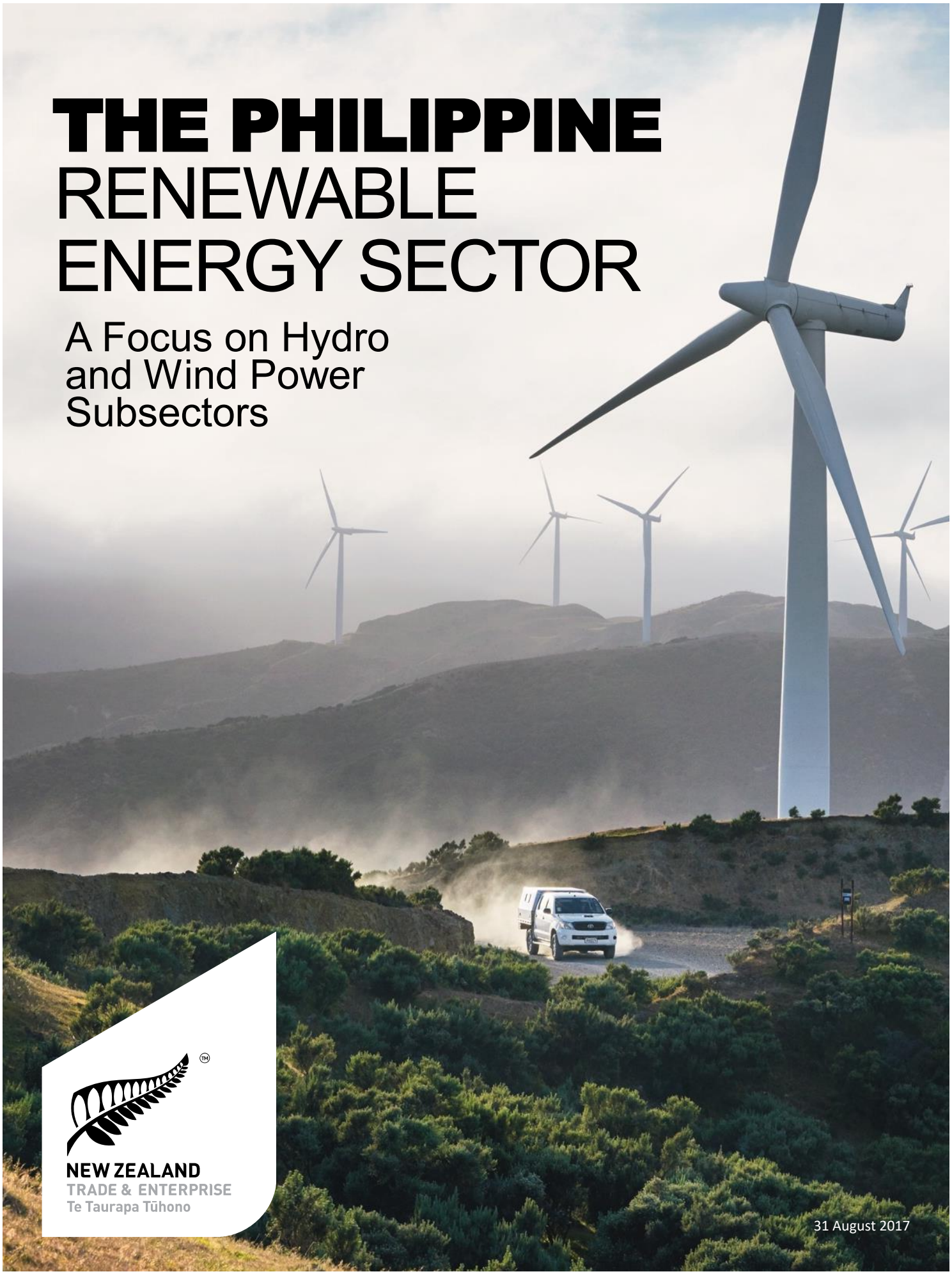
THE PHILIPPINE RENEWABLE ENERGY SECTOR

A Focus on Hydro and Wind Power Subsectors



NEW ZEALAND
TRADE & ENTERPRISE
Te Taurapa Tūhono

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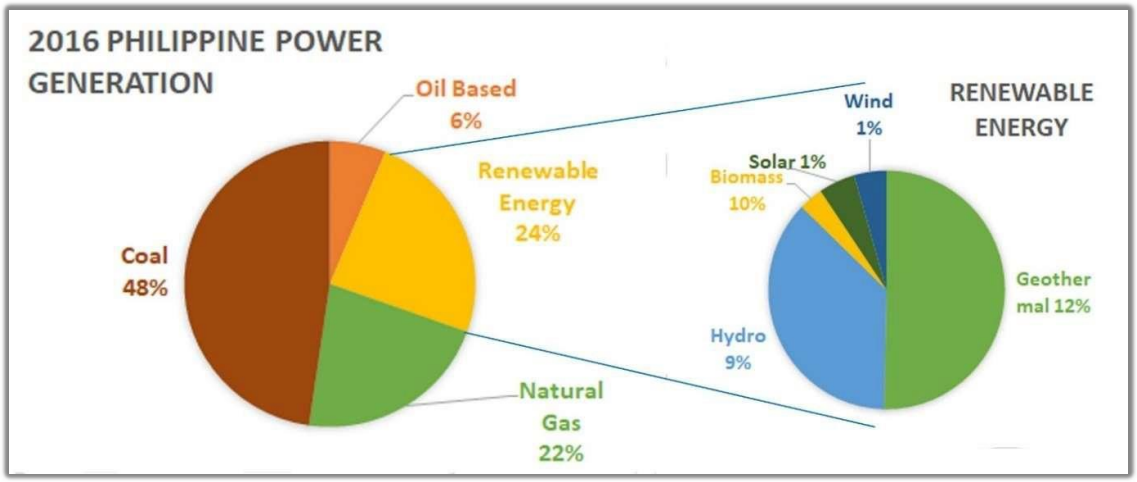
I. Overview of the Renewable Energy Sector in the Philippines

The Philippines has seen a significant rise in energy consumption for the past years. According to the Department of Energy (DOE), there is a 6.7% increase in energy consumption from 2014 to 2015 and an increase of 10.2% from 2015 to 2016. This is attributed to drastic rise in temperature due to extreme weather conditions, such as the El Niño phenomenon. Likewise, the growing economy of the Philippines is considered to contribute in the escalation of energy consumption, given the development of many businesses and industries.

Along with increased consumption, the 10% rise in power generation from 82,413 GWh in 2015 to 90,798 GWh in 2016 is also noteworthy to mention.

Out of the overall power generated in 2016, 24% came from the renewable energy (RE) sector, which includes geothermal, hydro, biomass, solar, and wind (Figure 1). Biggest contribution among all RE sources came from geothermal (12%), followed by biomass (10%), hydropower (9%) and solar and wind at both 1% each.

Figure 1. Philippine Power Generation 2016



Source: Department of Energy 2016

In fact, there is a substantial increase in power generation from renewable energy since 2003 from 17,692 GWh to 21,979 GWh in 2016. Renewable energy recorded a 36% share in total energy production in 2006, the highest for the past 14 years. Hydropower and geothermal both generated significant amount of energy during that year while there was a decline in energy generated by oil-based source.

RE from solar, wind and biomass started contributing in 2005 and recorded 245% growth from 2014 to 2015, which can be ascribed to the sudden surge of energy generated from solar power from 139 GWh to 1,097 GWh. (Table 1)

From 2003 to 2016, renewable energy recorded an annual average growth of 2%.

Table 1. Renewable Energy Production by Source, 2003 to 2016

	Hydropower (GWh)	Geothermal (GWh)	Solar, wind, and biomass (GWh)	Total RE produced (GWh)	Total energy produced (GWh)	RE as a % of total energy production
2003	7,870	9,822	-	17,692	52,941	33.42%
2004	8,593	10,282	-	18,875	55,957	33.73%
2005	8,387	9,902	19	18,308	56,568	32.36%
2006	9,939	10,465	55	20,459	56,784	36.03%
2007	8,563	10,215	59	18,836	59,612	31.60%
2008	9,834	10,723	63	20,620	60,821	33.90%
2009	9,834	10,324	79	20,237	61,934	32.68%
2010	9,788	9,929	90	19,807	67,743	29.24%
2011	7,803	9,942	205	17,950	69,176	25.95%
2012	10,252	10,250	259	20,761	72,922	28.47%
2013	10,019	9,605	279	19,903	75,266	26.44%
2014	9,137	10,308	364	19,809	77,261	25.64%
2015	8,665	11,044	1,254	20,963	82,413	25.44%
2016	8,111	11,070	2,798	21,979	90,796	24.21%

Source: DOE Power Statistics 2016

As of December 2016, the dependable capacity of the country's RE sources is 6,005 MW, with hydro having the biggest share at 16.7%, followed by geothermal at 8.8%. (Table 2)

Table 2. MW Capacity of all energy source as of December 2016

	Capacity (MW)		Percent Share (%)	
FUEL TYPE	Installed	Dependable	Installed	Dependable
Coal	7,419	6,979	34.6	36.5
Oil Based	3,616	2,821	16.9	14.8
Natural Gas	3,431	3,291	16	17.2
Renewable Energy	6,958	6,005	32.5	31.4
□ Geothermal	1,916	1,689	8.9	8.8
□ Hydro	3,618	3,181	16.9	16.7
□ Wind	427	383	2	2
□ Biomass	233	157	1.1	0.8
□ Solar	765	594	3.6	3.1
TOTAL	21,423	19,097	100	100

Source: Department of Energy

The country relies primarily on coal-powered energy source. However, the Department of Energy concentrates in promoting better quality of life for the Filipinos and in ensuring the delivery of secure, sustainable, sufficient, affordable and environment-friendly energy to all economic sector.

The significant growth in renewable energy is mainly attributed to the Philippine government's effort in developing sustainable energy source. Aside from this, promoting renewable energy is seen as a promising tool in dealing with the alarming issues of climate change and energy security.

The carbon footprints produced in burning non-renewable fuel do not only trigger extreme weather conditions but also contribute to air pollution that causes health issues. In fact, the World Health Organization (WHO) reported that air pollution alone kills almost ten million people every year worldwide—85% of these cases are in Asia.

As such, the Philippine Congress passed several legislative acts to start momentum on the use of RE as a key solution in minimizing the adverse effects of non-renewable energy by-products. The Electric Power Industry Reform Act of 2001, the Biofuels Act of 2006, the Renewable Energy Act of 2008, and the Climate Change Act of 2009 were among the policies placed to legally deal with global warming.

A. EPIRA or RA 9136

The Electric Power Industry Reform Act of 2001 (EPIRA) promotes the use of renewable energy particularly through private sector investment. There are two major reforms under EPIRA:

- Restructuring of the electricity supply industry – This includes the separation of the different components of the power sector namely, generation, transmission, distribution and supply
- Privatization of the National Power Corporation (NPC) – This one involves the sale of the state-owned power firm's generation and transmission assets (e.g., power plants and transmission facilities) to private investors.

The reforms are intended at encouraging better and greater competition because a more competitive power industry will generate lower power rates and a more efficient delivery of electricity supply to the end-users.

Also, RA 9136 created an independent, quasi-judicial regulatory body called the Energy Regulatory Commission (ERC) that replaced the Energy Regulatory Board. The ERC is tasked to do its traditional rate and service regulation functions and also focus on two primary responsibilities – "to ensure consumer education and protection, and to promote the competitive operations in the electricity market, faced with tremendous challenges in the restructured electric industry."

The ERC endeavors to create a regulatory environment that is democratic and transparent, and one that equitably balances the interests of both the consumers and the utility investors.

B. The Biofuels Act (2006)

The Biofuels Act of 2006 was created to develop and use renewable energy to lessen dependence on imported oil; reduce toxic emissions; and ensure the availability of alternative and renewable clean energy without causing any harm to the natural ecosystem, biodiversity and food reserves of the country. It promotes investment in biofuels through incentives including reduced tax on local or imported biofuels; and access to bank loans for Filipino citizens engaged in biofuel production. The law gave birth to the formation of the National Biofuel Board (NBB).

C. The Climate Change Act of 2009

The Climate Change Act of 2009 or RA 9729 was chiefly created as the Philippines' response to the worldwide phenomenon on climate change. To achieve its purpose, the Climate Change Act allowed mainstreaming of climate change into government formulation of programs and projects, plans and strategies, and policies plus the creation of Climate Change Commission (CCC), and the establishment of Framework Strategy and Program for climate change – to incorporate a gender-sensitive, pro-children and pro-poor perspective in all climate change and renewable energy efforts of the country.

D. Renewable Energy Act of 2008 and Renewable Portfolio Standards

The Philippine government also promulgated Republic Act 9513, otherwise known as the Renewable Energy Act of 2008 that outlines the policy that will accelerate the development of the renewable energy sector in the country. This is to achieve energy self-reliance and adopt clean energy in mitigating climate change while also promoting socio-economic development of rural areas. In order to encourage investments on the renewable energy projects, the government offers fiscal and non-fiscal incentives to possible investors.

Fiscal incentives include:

- Income Tax Holiday and Low-Income Tax Rate
- Reduced Government Share
- Duty-free Importation of Equipment and VAT-zero Rating
- Tax Credit on Domestic Capital Equipment
- Special Realty Tax Rate on Equipment and Machinery
- Cash Incentive for Missionary Electrification
- Exemption from Universal Charge
- Payment of Transmission Charges, and
- Tax Exemption on Carbon Credits.

Meanwhile, Department of Energy's Circular No. D02009-05-0008, otherwise known as Implementing Rules and Regulations of Republic Act 9513, institutionalized the Renewable Portfolio Standards (RPS). This is a policy that "places an obligation on electric power industry participants such as generators, distribution utilities, or suppliers to source or produce a specified fraction of their electricity from eligible RE Resources, as may be determined by NREB".

Under the same DOE Circular, some of the RPS rules include the following:

1. Types of RE Resources, and identification and certification of generating facilities using said resources that shall be required to comply with the RPS obligations;
2. Yearly minimum RPS requirements upon the establishment of the RPS rules;
3. Annual minimum incremental percentage of electricity sold by each RPS-mandated electricity industry participant which is required to be sourced from eligible RE Resources and which shall, in no case, be less than one percent (1%) of its annual energy demand over the next ten (10) years;
4. Technical feasibility and stability of the transmission and/or distribution grid systems; and
5. Means of compliance by RPS-mandated electricity industry participant of the minimum percentage set by the government to meet the RPS requirements, including direct generation from eligible RE Resources, contracting the energy sourced from eligible RE Resources, or trading in the REM.

E. The National Renewable Energy Program

The Department of Energy (DOE) organized the National Renewable Energy Program (NREP) to help increase the RE-based capacity of the country to about 16,000 MW in the next two decades. As of this writing, renewable energy has been efficiently pulling up the country's energy supply moving it closer to target.

NREP intends to:

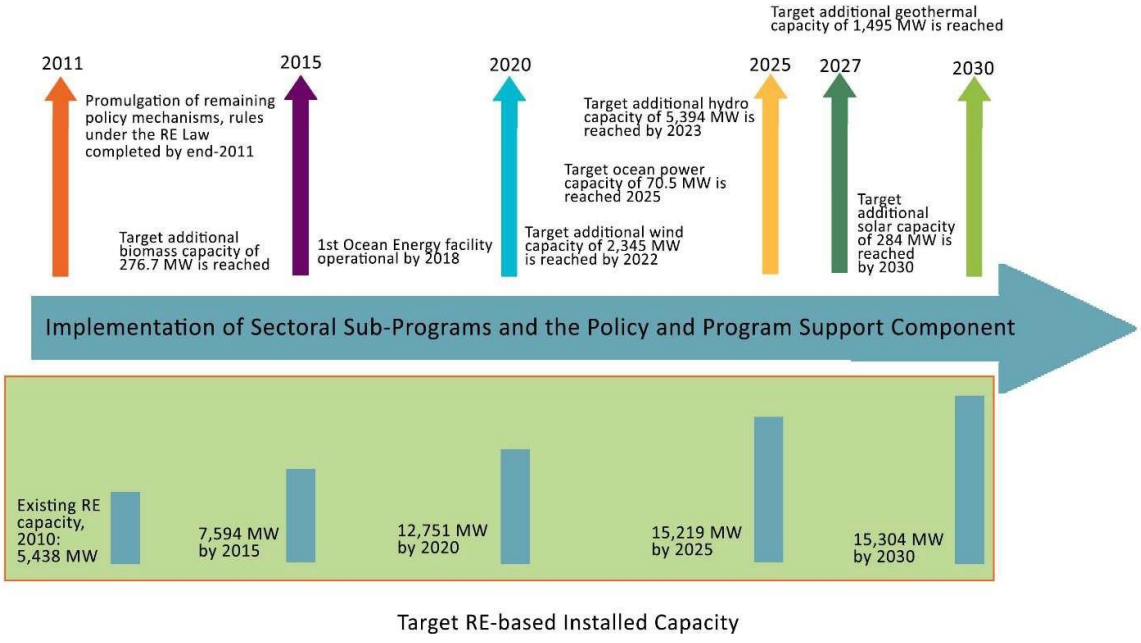
- increase geothermal capacity by 75%
- increase hydropower capacity by 160%

- add 277 MW to biomass power capacity
- add 2,345 MW wind power capacity
- add 284 MW to solar power capacity (achieve 1,528 MW target)
- develop the first ocean energy facility in the country

As per DOE, the country reached 40.7 million tons of oil equivalent (MTOE) total primary energy in 2010 wherein 23.4 MTOE was sourced locally. This event set the energy sufficiency level to 57.5% where a big chunk of share came from RE of the indigenous energy supply mix. Geothermal share is 53.2%, followed by 33.3% and 12.1% for biomass and hydro, respectively.

The NREP makes sure that policies under the Republic Act 9513 or the Renewable Energy law, which is about the promotion of the development, utilization, and commercialization of RE, are put into action. Below is the RE Road Map.

Figure 2. Info graph of the National Renewable Energy Program (NREP) Renewable Energy Road Map.



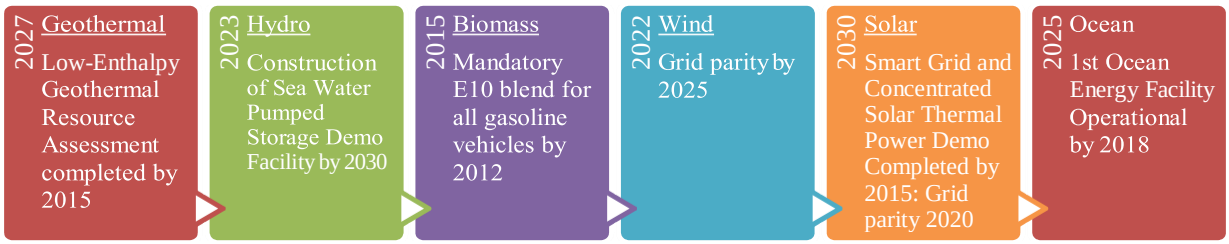
Source: Reprinted from NREP Home at the DOE Portal, retrieved from www.doe.gov.ph/national-renewable-energy-program

The RE Road Map plans and specify projects and activities in each sector, depending on the gaps and challenges facing the sector plus the needs of the stakeholder groups being served, will be considered. The list of events or activities that cut across all the RE sectors are grouped into the Policy and Program Support Component. This involves common activities which require a harmonized and cohesive approach to implementation that include:

- Policy Support - the formulation, implementation and monitoring of the mechanisms, rules and regulations prescribed by the RE Law; and
- Program Support – common support activities to ensure the smooth implementation of the NREP, e.g., establishment of the RE one-stop-shop, Integrated IEC Plan, RE Information Exchange and M&E system.

Figure 3 summarizes the milestones projected in the various RE sectors.

Figure 3. NREP Projected Milestone, 2011-2030



Source: NREP, DOE.

In order to increase production of RE sources, the NREP plotted the capacity addition based on a per RE source from 2015 to 2030.

The estimated capacity addition of 9,865 MW is broken down as follows:

Table 3. NREP Estimated Capacity Addition 2015-2030

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	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	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

Source: NREP, DOE.

To achieve the additional RE-based capacities, a highly successful implementation of the NREP is needed as well as the policy and incentive mechanisms in the RE Law. Special attention will be given to the appropriate conduct of grid impact studies required for all facilities connecting to the grid.

The continuous progress of RE resources shall coincide with the need to deliver acceptable, dependable and high-quality power. It should be noted that while efforts to facilitate RE entry into the grid will continue to be strengthened, the stability of the grid should be ensured as well. Thus, innovative mechanisms to assist the concerned industry player, as may be necessary, may be established as the NREP progresses.

Moreover, NREP states that "RE projects in off-grid and SPUG or missionary areas, will be supported through effective coordination among DOE units concerned and its attached agencies (i.e., NPC-SPUG, NEA), as well as the electric cooperatives. The RE project developers' work programs shall be aligned

and harmonized with the Missionary Electrification Development Plan. Compliance with relevant procedures and guidelines by Qualified. Third Parties or New Power Providers shall be ensured."

II. Hydro Energy Profile

A. Background and History

Hydropower is one of the largest sources of energy totaling to roughly 20% of the worldwide demand of electricity. Well-resourced countries get the majority of their energy from the said source.

In 2016, out of the overall power generated in the Philippines, 24% came from renewable energy (RE) sector, which includes geothermal, hydro, biomass, solar, and wind. Hydropower contributed 9% or 8,110,915 kw.

It was in 1913 when the hydropower development started in the Philippines. The first power plant was established by missionaries in Baguio City called the Camp John Hay Hydroelectric Power Plant with an installed capacity of 560 kilowatts. Since then, the private sector continued the development of water resources for power generation until Commonwealth Act No. 120 created the National Power Corporation (NPC) in 1936.

Hydropower facilities has three types - impoundment, diversion, and pumped storage. There are hydropower plants that use dams and others do not. In some instances, many of the dams were built for other purposes and hydropower was added later. A good example is in the United States, where there are about 80,000 dams but only 2,400 produce power. The rest of them are for tourism or recreation purposes or used as stock farms and ponds or used as flood control, water supply, and sometimes for irrigation.

Hydropower plants range in size from small systems for a home or village to large projects producing electricity for utilities.

An impoundment facility is the most common type of hydroelectric power plant. It is typically a large hydropower system that uses a dam to store river water in a reservoir. Water released from the reservoir flows through a turbine, spinning it, which in turn activates a generator to produce electricity. The water may be released either to meet changing electricity needs or to maintain a constant reservoir level.

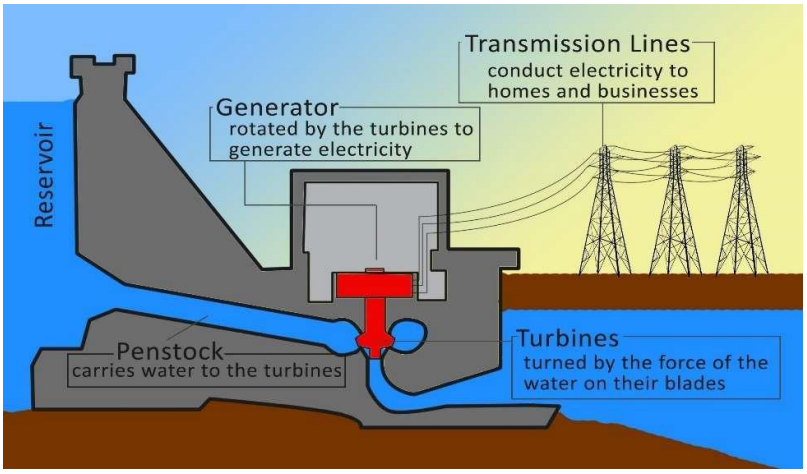
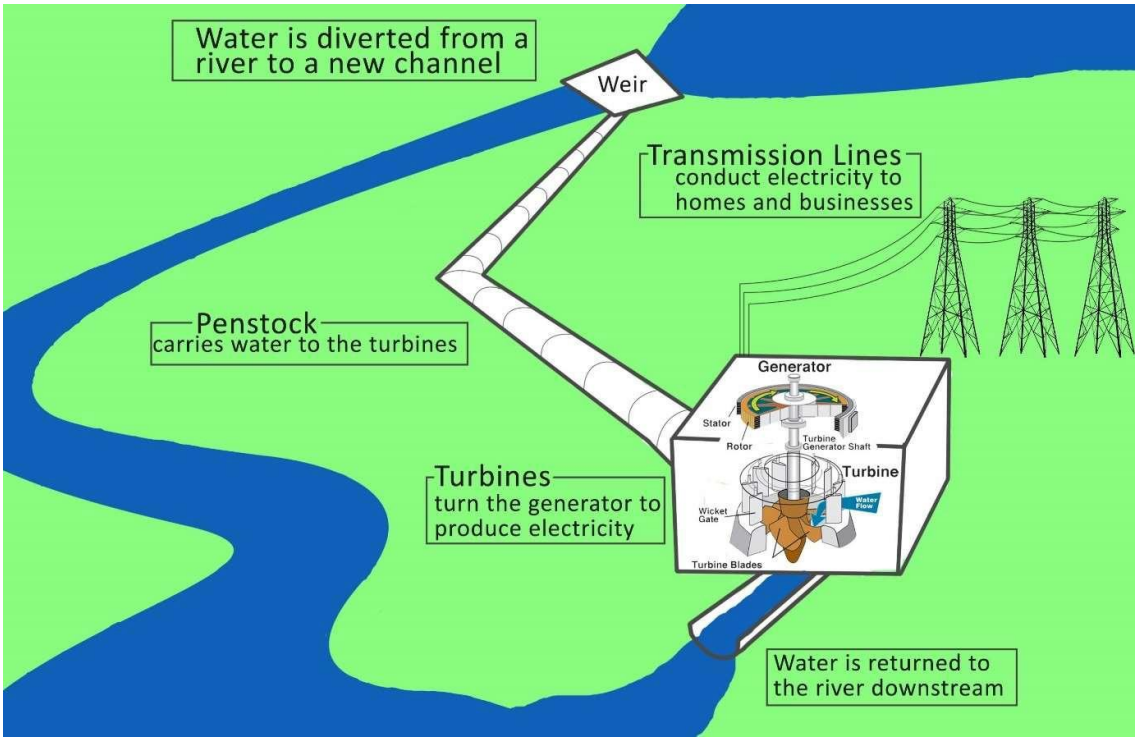


Figure 4. Cross section conventional hydropower facility that uses an impoundment dam.

Source: Based on Office of Energy Efficiency & Renewable Energy, US

A diversion, sometimes called run-of-river type, is a facility that channels a portion of a river through a canal or penstock. It may not require the use of a dam. Run-of-river hydroelectricity (ROR) is a type of hydroelectric generation plant where little or no water storage is provided. ROR hydroelectricity is considered ideal for streams or rivers that can sustain a minimum flow or those regulated by a lake or reservoir upstream.

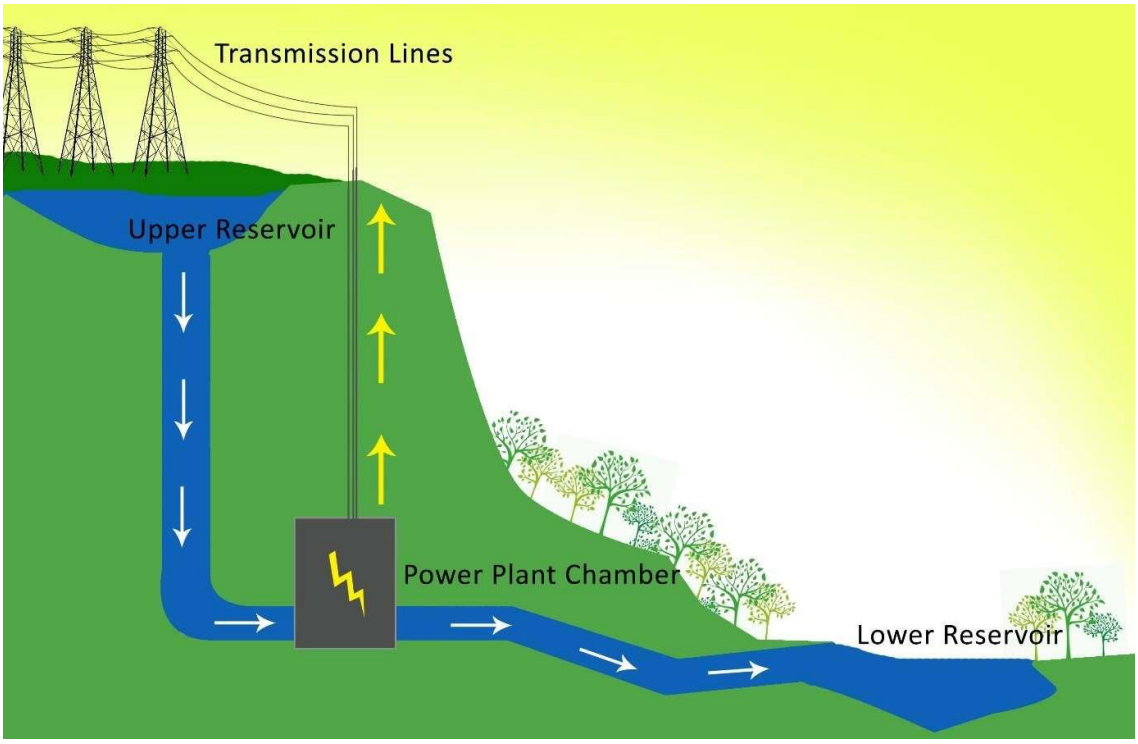
Figure 5. Typical run-of-river scheme



Source: Based on Practical Action (n.y.); http://www.sswm.info/content/hydropower-small-scale

Another type of hydropower called pumped storage works like a battery, storing the electricity generated by other power sources like solar, wind, and nuclear for later use. It stores energy by pumping water uphill to a reservoir at higher elevation from a second reservoir at a lower elevation. When the demand for electricity is low, a pumped storage facility stores energy by pumping water from a lower reservoir to an upper reservoir. During periods of high electrical demand, the water is released back to the lower reservoir and turns a turbine, generating electricity.

Figure 6. Diagram of a Pumped-Storage Plant



B. Hydropower Plants in the Philippines

Table 4. List of Hydroelectric Power Plants

NAME	SUB TYPE	INSTALLED CAPACITY MW	LOCATION
LUZON			
Large Hydroelectric Plants			
Kalayaan PSPP	Dam Type HEPP	739.2	Kalayaan, Laguna
San Roque	Dam Type HEPP	435.0	San Manuel, Pangasinan
Magat	Dam Type HEPP	380.0	Ramon, Isabela
Angat M	Dam Type HEPP	200.0	Norzagaray, Bulacan
Casecnan (NIA)	Dam Type HEPP	165.0	Pantabangan, Nueva Ecija
Binga	Dam Type HEPP	140.0	Itogon, Benguet
Pantabangan-Masiway	Dam Type HEPP	132.0	Pantabangan, Nueva Ecija
Ambuklao	Dam Type HEPP	105.0	Bokud, Benguet
Bakun	Run-of-River Type HEPP	70.0	Alilem, Ilocos Sur
Angat A	Dam Type HEPP	46.0	Norzagaray, Bulacan
Caliraya	Dam Type HEPP	35.0	Lumban, Laguna
HEDCOR	Run-of-River Type HEPP	33.8	Benguet
Botocan	Run-of-River Type HEPP	22.8	Kalayaan, Laguna
Sabangan	Run-of-River Type HEPP	13.2	Sabangan, Mt Province
Small Hydroelectric Plant			

□ NIA-Baligatan	Run-of-River Type HEPP	6.0	Ramon, Isabela
VISAYAS			
□ AMLAN HEPP	HEPP Run-of-River type	0.8	Negros Orienta
□ JANOPOL HEPPHEPP	Run-of-River type	5.2	Bohol
□ LOBOC HEPP HEPP	Run-of-River type	1.2	Loboc, Bohol
□ SEVILLA HEPP HEPP	Run-of-River type	2.5	Sevilla, Bohol
□ VILLASIGA HEPP HEPP	Run-of-River type	8.1	Bugasong, Antique
MINDANAO			
Large Hydroelectric Plants			
□ AGUS 1	Dam-type HEPP	80.0	Marawi City, Lanao del Sur
□ AGUS 2	Dam-type HEPP	180.0	Saguiaran, Lanao del Sur
□ AGUS 4	Dam-type HEPP	158.1	Baloi, Lanao del Norte
□ AGUS 5	Dam-type HEPP	55.0	Buru-un, Iligan City, Lanao del Norte
□ AGUS 6	Dam-type HEPP	219.0	Buru-un, Iligan City, Lanao del Norte
□ AGUS 7	Dam-type HEPP	54.0	Buru-un, Iligan City, Lanao del Norte
□ PULANGI 4	Run-of-River type HEPP	255.0	Maramag, Bukidnon
Small Hydroelectric Plant			
□ TUDAYA 2	Run-of-River type HEPP	8.4	Sta. Cruz, Davao del Sur

Source: DOE

Kalayaan PSPP - Located at Kalayaan, Laguna, Philippines, the first unit of this plant was first commissioned in 1983 and is currently operated by CBK Power Company Ltd. It is the only pumped storage facility in the country, with a design capacity of 709 MWe. It supplies electricity and pumps water from Laguna Lake into Caliraya.

San Roque - is a fully operating hydroelectric power plant located at San Manuel, Pangasinan, Philippines, which was constructed and currently owned by San Roque Power Corporation. It is said to be the largest hydro installation in SouthEast Asia and the 12th largest dam in the world. It has a design capacity of 345 MWe and stands at about 200m.

Magat - This hydropower plant is located on the Magat River and is owned and operated by the National Irrigation Authority. Its power capacity is at 360 MW but can reach to 540 MW since it was designed to accommodate two more units. It is a "peaking power plant" that is connected to the Luzon power grid, making it possible for the plant to supply electricity when needed.

Angat Dam - Located at San Lorenzo, Bulacan, Philippines, it has installed capacity of 246 MW, making it as one of the biggest hydropower plant in the country. It was commissioned in 1967, with average inflow of 60 cms which are allocated in irrigation, water supply, power generation, and river maintenance.

Casecnan (NIA) - Located in Nueva Ecija, this irrigation and hydroelectric plant is considered as the most expensive facility to be built in the country. Instead of the planned 150 MW capacity of the plant, it has only been supply 140 MW to the Luzon grid since it started operation.

Binga - It was commissioned in 1960 and built near the Ambuklao hydropower plant. Its initial capacity was 100 MW but after rehabilitation in 2013, it has now four turbines of 33 MW each. About 350 GWh is the reported average annual production. Binga is also considered a peaking plant.

Pantabangan-Masiway - Located in Nueva Ecija, this hydropower plant is owned and operated by First Gen Hydropower Corporation. It has 132-MW generating capacity after it was rehabilitated by First Gen in 2010. This plant provides water for irrigation and hydroelectric power generation.

Ambuklao - It is one of the oldest hydropower plants in the country as it was commissioned in 1956 by the National Power Corporation. Initial installed capacity was at 75 MW but after rehabilitation in 2011, it increased to 105 MW. Its average annual production is now at 332 GWh. Agno River supplies most of the water used by this plant.

Bakun - Based in Alilem, Ilocos Sur, this is the first hydropower project in the country that was built under Build-Own-Operate-Transfer (BOOT) scheme. Its generating capacity is at 70 MW and has four units of turbines. It has also been providing electricity while addressing importation issues in coal and petroleum.

Caliraya - Commissioned in the 1940s, this is the first major hydroelectric power plant project of the National Power Corporation. Its reservoir is shared by the Kalayaan PSPP, while also utilizing the water from Caliraya River Basin. After the rehabilitation done by CBK PCL, the Caliraya plant can now generate 22.6 MW at 271m net head using its two units.

HEDCOR (Hydro Electric Development Corporation)- With over 22 hydropower plants located in Benguet, Davao City, Davao del Sur, Ilocos Sur, and Mt. Province, this subsidiary of Aboitiz Power has more than 30 years of experience in run-of-river hydropower systems. It has an ongoing project in Bukidnon that can generate 360 GWh per year and a design capacity of 68.8 MW.

Botocan - It is considered the oldest hydroelectric power plant in the country as it was built in the 1930s in Majayjay, Laguna. It stands at 30.48 m, has four spillway gates, and an initial generating capacity of 8,000 kw from two units and 960 kw from one small unit. After its rehabilitation by a private entity, the plant has now two new 10 MW generator units.

Sabangan - Recently completed in 2015, this hydropower plant is located at Sabangan, Mt. Province with annual generation of 55-M kWh and generation capacity of 14 MW. This is the 2nd run-of-river hydropower plant constructed by Hedcor, Inc.

Baligatan - This hydroelectric power plant is part of the National Irrigation Administration's MARIIS (Magat River Integrated Irrigation System) project that aims to serve the provinces of Isabela, Quirino, and municipality of Alfonso Lista in Ifugao. The project is composed of the Magat Reservoir and three other dams, including the 6 MW Baligatan hydroelectric power plant.

C. Hydropower Development

Considered as the largest and the most mature application of renewable energy is hydropower. According to studies, hydropower provides approximately 20% of the world's electricity and in Europe,

hydropower contributes at least 17 percent to its electricity supply, which translates avoiding 67 million tons of CO2 emissions annually.

In the Philippine, there are many areas that are suitable for hydroelectricity production but it can cause upstream and downstream flooding during monsoonal weather and when excess water is released from dams. Hydroelectric plants are dispersedly located in various areas across the archipelago, comprising conventional dam and run-of-the-river types. Almost all of the large hydroelectric plants ranging from over 50 MW are connected to the main transmission grid, while most of the small (10MW to 50 MW) and mini (101 kW to 10 MW) hydro plants are embedded to the local distribution system.

There is yet no international consensus on how to classify hydro systems by size. The Philippines has adapted the European classification, but defines "small" systems into "mini" and "micro." RA 7156 defines mini-hydro systems as those hydro installations with size ranging from 101 kW to 10MW. Meanwhile, micro hydro systems refer to installations with capacity of 100 kW or less. Small hydropower plants are mainly 'run-off-river' systems since they involve minimal water impounding and because of that they are regarded as a good source of energy generation.

According to a USDA study, it is estimated that a 5-MW small hydropower plant can:

- supply power to about 5,000 families
- replace 1,400 tons of fossil fuel
- avoid emissions of 16,000 tons of CO2 and more than 100 tons of SO2 annually

In the Philippines, as of June 2017, the Department of Energy has awarded 445 hydro projects with a potential capacity of 13,419.73 M. There are 93 pending hydro installations that can produce power up to 2,270.67 MW (Table 5).

Table 5. Number of Awarded and Pending Hydro Projects Under Renewable Energy (RE) Law as of 30 June 2017

Awarded Projects			Pending Applications	
• Grid-Use	445		• Grid-Use	93
• Own-Use	-		• Own-Use	-
Potential Capacity	MW		Potential Capacity	MW
• Grid-Use	13,419.73		• Grid-Use	-
• Own-Use	-		• Own-Use	-
Installed Capacity	MW		Installed Capacity	MW
• Grid-Use	965.04		• Grid-Use	2,270.67
• Own-Use	-		• Own-Use	-

NOTE: *-excluding 55 installed projects with 3,050.47MW capacity under RA 7156, CA 120, PD 1645, RA 3601 & Own-Use
Source: Department of Energy

Meanwhile, the National Irrigation Administration (NIA) is moving forward with the development of hydropower projects on its existing irrigation systems and future irrigation projects. Just recently, the NIA signed a memorandum of agreement with Nascent Technologies Corp. for the development and

construction of the 400-kW Barit Irrigation Discharge Hydroelectric Power plant. This plant is expected to cost PHP 27.6 million (NZD 755,259).

There are 357 potential irrigation sites for hydropower in the country, according to previous studies conducted by NIA. Just this year, a 1-MW Rizal Hydropower Project was developed, located near the main canal of Pampanga River Irrigation System (PRIS), Nueva Ecija.

These projects were approved and memorandums of agreement were signed with their respective developers:

- The 8.5-MW Maris Main (South) Canal Hydroelectric Project located in Isabela - to start commercial operation in February 2018
- The Marbel #1 Mini Hydropower Project in South Cotabato
- Butao Irrigation Drop Mini Hydropower Project in Pangasinan

Meanwhile, negotiations are ongoing for the following:

- 630-kW Munoz Hydropower Project in the Upper PRIS, Nueva Ecija
- 1-MW Bulanao Mini-Hydropower Project in the Chico River Irrigation System, Kalinga
- 3.6-MW Addalam Hydroelectric Project in Addalam River Irrigation Project, Quirino
- Agno RIS main canal in the Agno River Integrated System, Pangasinan

NIA pronounces "the development and construction of hydropower projects is aligned with Presidential Decree (PD) No. 552, Section 2C dated September 11, 1974 which gives NIA the directive to achieve the optimum utilization and control of water resources primarily for Irrigation purposes, secondarily for Hydraulic Power Development and for Domestic Water supply and others."

NIA was working with the Philippine National Oil Company Renewables Corp. to create a new unit to study the potential of developing small hydropower projects in irrigation facilities across the country. (HydroWorld, February 2017).

The DOE has been encouraging the development of hydropower resources, giving special incentives to proponents and investors, in support of the national government's vision to accelerate RE development in the country, which seeks to curb dependence on volatile and often polluting energy sources such as coal and petroleum.

D. Advantages and Disadvantages of Hydropower

Advantages
1. Renewable power source/energy As a non-consumptive water use, small hydropower is a renewable energy source. Hydroelectric energy is renewable. This means that we cannot use up. However, there's only a limited number of suitable reservoirs where hydroelectric power plants can be built and even less places where such projects are profitable.
2. Clean Fuel Source/ Green Hydropower is fueled by water, making it a clean fuel source. It does not pollute the air like other power plants (that burns coals, fossil fuels, and natural gas). Generating electricity with hydro energy is not polluting itself. The only pollution occurs during the construction of these massive power plants.

3. Dependable/ Reliable

Hydroelectricity is very reliable energy. There are very little fluctuations in terms of the electric power that is being by the plants, unless a different output is desired. Countries that have large resources of hydropower use hydroelectricity as a base load energy source. As long as there is water in the magazines electricity can be generated.

4. Adjustable/ Flexible

As previously mentioned, adjusting water flow and output of electricity is easy. At times where power consumption is low, water flow is reduced and the magazine levels are being conserved for times when the power consumption is high.

5. Benign/ Safe

Compared to among others fossil fuels and nuclear energy, hydroelectricity is much safer. There is no fuel involved (other than water that is).

6. Production Costs Are Eliminated

The main advantage of hydropower is that production costs are eliminated. The maintenance costs of such sources of "green energy" is very small, since the equipment is automated and does not require a large number of staff during power generation

7. No reservoir for small hydroplants

As no reservoirs are created, small hydropower does not cause the problems associated with reservoirs such as methane emissions, displacement of people, sedimentation, and disrupted stream dynamics (see factsheets on large-scale hydropower and man-made reservoirs to find out more).

Disadvantages of Hydroelectric Energy

1. Costly

It is common knowledge that building power plants in general is expensive. Hydroelectric power plants are not an exception to this. On the other hand, these plants do not require a lot of workers and maintenance costs are usually low.

2. Environmental Impact

The environmental consequences of hydropower are related to interventions in nature due to damming of water, changed water flow and the construction of roads and power lines. Hydroelectric power plants may affect fish is a complex interaction between numerous physical and biological factors. More user interests related to exploitation of fish species, which helps that this is a field that many have strong opinions on. Fish habitats are shaped by physical factors such as water level, water velocity and shelter opportunities and access to food. Draining would be completely devastating to the fish. Beyond this, the amount of water may have different effects on the fish in a river, depending on the type and stage of the lifecycle. Not all unregulated river systems are optimal in terms of fish production, because of large fluctuations in flow.

3. Limited Reservoirs

We have already started using up suitable reservoirs for hydroelectric power plants. There are currently about 30 major power plants that are expected to generate more than 2.000 MW under construction. Only one of these projects was started in the last two years.

4. Droughts Electricity generation and energy prices are directly related to how much water is available. A drought could potentially affect this. When water is not available, the hydropower plants cannot produce electricity.
5. Water Quality Impact Hydropower can impact water quality and flow. Hydropower plants can cause low dissolved oxygen levels in the water, a problem that is harmful to riparian (riverbank) habitats and is addressed using various aeration techniques, which oxygenate the water. Maintaining minimum flows of water downstream of a hydropower installation is also critical for the survival of riparian habitats.

E. Challenges in the Hydropower Sector

Economic growth has been impeded in the Philippines by the unreliability and high cost of energy – which is another challenge. Reliable and secure electricity services at competitive rates are essential to improving the investment climate in a country that has limited fossil-fuel reserves and therefore is highly dependent on renewable and imported energy. The Philippines has some of the most expensive electricity in Southeast Asia, averaging PHP 8.38 per kilowatt-hour as of August 2017. This is because of the following:

- the archipelagic geography makes electricity costly in some areas
- generation, transmission, and distribution systems are inefficient
- investment in the sector is low, coupled with the high cost of investments made on some of the new power plants

The challenge in the energy sector is to ensure sustainable and reliable supply at reasonable cost.

Most industries in the Philippines are highly supported by the private sector. The country has a good track record of successful independent power producers (IPPs) and one of the first successful IPPs was the 735MW Pagbilao coal-fired plant in Quezon. Under the Public-Private Partnership (PPP) framework, the power crisis in the early 90s led to a number of IPPs being set up to meet the power demand; which resulted to investments from foreign companies like AES, Tokyo Electric, and Marubeni as well as establishment of domestic power companies like Aboitiz, Ayala, San Miguel Power, Energy Development Corporation, among others.

An increase in hydropower production was identified as a critical contribution to reducing CO2 emissions, and compensating the highly fluctuating supply from renewables like wind. With changing demand and the environmental and socio-economic constraints, achieving such increase can be challenging and can be achieved by innovative and sustainable solutions for new hydropower plants and by expanding and maximizing the operation range of the existing ones.

Climate change is a major challenge because of water resources availability and the increased sediment yields in plants plus poses an increased risk due to natural hazards that are expected to threaten both hydropower production and safety of hydropower plants.

Environment-friendly deployment is recommended to address some of these challenges – which include water quality (water aeration in the turbine draft tube); environment-friendly materials; oil free or biodegradable-oil lubrication; fish friendly design; low speed turbine design; landscape integration and visual impact; acoustic noise mitigation; budget designs for completely underground plants, mitigation of hydro- and thermopeaking; adaptation/improvement of enforced environmental flow concepts.

III. Wind Energy Profile

A. Background and History

One of the big steps taken by the Philippines in promoting renewable energy was the establishment of the first wind farm in Northern Luzon in 2005. An immediate of 17 GWh was recorded in 2005 from the wind energy sector, which started a positive trend in the market. This successful operation in Bangui, Ilocos Norte started on a 25-MW-capacity wind farm and was expanded in 2008 to 33 MW capacity.

The first wind farm paved the way for the development of the wind energy sector in the Philippines, as part of the government's efforts to decrease the country's dependence in the ever-increasing price of coal- and oil-based energy. As of 2016, 975 GWh is generated by wind power plants, contributing 1.1% to the total power generation in the country.

B. Wind Power Plants in the Philippines

Wind Energy is a relevant source of renewable energy in the Philippines because of its location and weather. There are currently seven wind power plants in the Philippines, three of which are located in Ilocos Norte. As of June 2017, DOE stated that there are 62 awarded wind projects with a total of 426.90 MW of installed wind capacity and an additional potential of 2,381.50 MW.

Table 6. List of Wind Power Plants

NAME	SUB TYPE	CAPACITY MW	LOCATION
Bangui Wind Power Ph1 and Ph2	On-shore Wind Turbine	33	Bangui Bay, Ilocos Norte
Bangui Wind Power Ph3	On-shore Wind Turbine	18.9	Bangui Bay, Ilocos Norte
Burgos Wind	On-shore Wind Turbine	139	Burgos, Ilocos Norte
Caparispisan Wind	On-shore Wind Turbine	81	Pagudpud, Ilocos Norte
Pillilla Wind Ph1	On-shore Wind Turbine	67.5	Pillilla, Rizal
Pillilla Wind Ph2	On-shore Wind Turbine	72	Pillilla, Rizal and Mabitac, Laguna
San Lorenzo Wind	On-shore Wind Turbine	54	San Lorenzo, Guimaras
VISAYAS			
Nabas Wind	On-shore Wind Turbine	36	Nabas, Aklan
TAREC	On-shore Wind Turbine	54	San Lorenzo, Guimaras
Mindoro Wind Farm	On-shore Wind Turbine	48	Puerto Galera, Mindoro Oriental

Source: DOE, as of June 2017

- Bangui Wind Farm

The first wind powerplant in the Philippines is the Bangui Wind Farm. Not only is it the first in the Philippines but it is also the first one in Asia. The project started in 2000 by the NorthWind Power Development Corporation (NorthWind) through the Danish International Development Agency (DANIDA). Aside from its natural wind resource capacity of Ilocos Norte, it also became an ideal place to build a wind energy source due to the poor power coverage experienced in the province. It is located at the border of the power grid that comes from La Union, making the province susceptible to power outages, thereby resulting to lower market value for investors. Hence, the Bangui Wind Farm project was positively received by the local residents and the government as it promised sustainable energy source as well as economic boost from potential investors and tourists.

The construction of Bangui Wind Farm project consisted of three phases. Phase I ended in June 2005 with the construction of 15 wind turbines for 25 MW wind capacity. The initial phase amounted to US$ 29.35 million. In the second phase, an additional of 5 wind turbines was added, thus increasing the wind power capacity to 33 MW but at the cost of an additional US$13.1 million. Phase III was recently completed last 2014 with an additional 18.9MW wind power capacity.

- Burgos Wind Power Project

Installed at Burgos, Ilocos Norte on November 2014, the Burgos Wind Power Project is the biggest wind farm in the Philippines. This wind project was installed in two phases. The first phase installed a wind capacity of 87 MW and the second phase with 63 MW wind capacity. Burgos Wind Farm uses 50 3.0 W wind turbine generators (WTGs) and ancillary plant equipment. There is also a construction of a 115-kilovolt transmission line, approximately 42 kilometers (km) in length; and a construction of a substation in Burgos and the expansion of an existing substation in Laoag City, Ilocos Norte.

As of now, Burgos Wind Project is commercially owned by EDC Burgos Wind Power Corporation that is indirectly owned by the Lopez Holdings Corporation.

- Caparispisan Wind Power Project

Caparispisan Wind Power Project is located in Pagudpod, Ilocos Norte and is owned by North Luzon Renewable Energy Corporation. It is installed with 27 Siemens SWT-3.0-101 turbines and can generate 81 MW wind power capacity.

- Pililla Wind Power Project

In June 2005, the Pililla Wind Power Project was declared operational with 54 MW installed wind power capacity. This is the third wind farm installed in the Philippines. The Pililla Wind Farm is estimated to generate enough power to cover 66,000 household. The Alternergy Wind One Corporation constructed the said wind farm and financed it through a non-recourse project facilitated by Banco De Oro, RCBC, and China Bank. The whole project costed US$ 130 million.

In addition to this, Alternergy was awarded two other wind power projects. The first one is located in Abra de Ilog in Occidental Mindoro called Abra de Ilog Wind Power Project, with a potential wind capacity of 40 MW. The other one is in Pililla, Rizal and Mabitac, Laguna called Mt. Sembrano Wind Power Project that have a potential wind capacity of 80.40 MW. The Mt. Sembrano Wind Power Project is considered an expansion of the Pililla Wind Power Project, adding 25 turbines to the existing 27 turbines in Pililla, Rizal.

- San Lorenzo Wind Power Project

San Lorenzo Wind Power Project, with 54 MW wind power capacity, was installed by Trans-Asia Renewable Energy Corporation in San Lorenzo, Guimaras. Each of the 27 wind turbines, supplied by the Spanish company Gamesa, generates 2 MW each. In total, San Lorenzo Wind Farm generates about 120.79 GWh, supplying power not only in Guimaras but also in nearby Panay Island grid.

- Nabas Wind Power Project

PetroWind Energy Inc. formed a joint corporation with PGEC (40%), CapAsia Wind Holdings Cooperatief U.A. (40%), and EEI Power Corporation (20%) to install and develop the Nabas Wind Power Project. The wind farm used 18 2MW Gamesa G90 Class IA, generating a total wind power capacity of 36 MW. Nabas Currently, Nabas Wind Power Project is undergoing Phase II to acquire an additional potential capacity of 14 MW. In June 2015, Phase I was successfully supplying power to the Western Visayas Grid.

- Mindoro Wind Farm

Wind Energy Power System (WEPS) is a wind farm project located near Puerto Galera, in Mindoro Oriental. It is being developed jointly by Philippine Hybrid Energy Systems, Inc.; Italian power utility developer CMC Asia, Inc. and turbine manufacturer and building contractor, Gamesa Eolica, S.L. Unipersonal of Spain. The whole project has 8 towers and will be delivered in 3 phases. Phase 1 is ongoingand targeted to be completed this December. Once completed, the wind farm is expected to reduce the present power rate in the area from PHP 13 (NZD 0.36) per kilowatt-hour to only PHP 6.50 (NZD 0.18) per kwh.

C. Wind Farm Development

Wind turbines operate on a simple principle -- the energy in the wind turns two or three propeller-like blades around a rotor. The rotor is connected to the main shaft, which spins a generator to create electricity.

Available locations to Establish Wind Power Plants

In 2001, a study conducted by the National Renewable Energy Laboratory (NREL) shows that the Philippines has many good to excellent areas of wind resource. These locations combined have the potential to generate an estimate of 195,200 GWh per year. Despite the 975 GWh wind power generated in 2016, there is still almost 100% of wind energy resource left untapped.

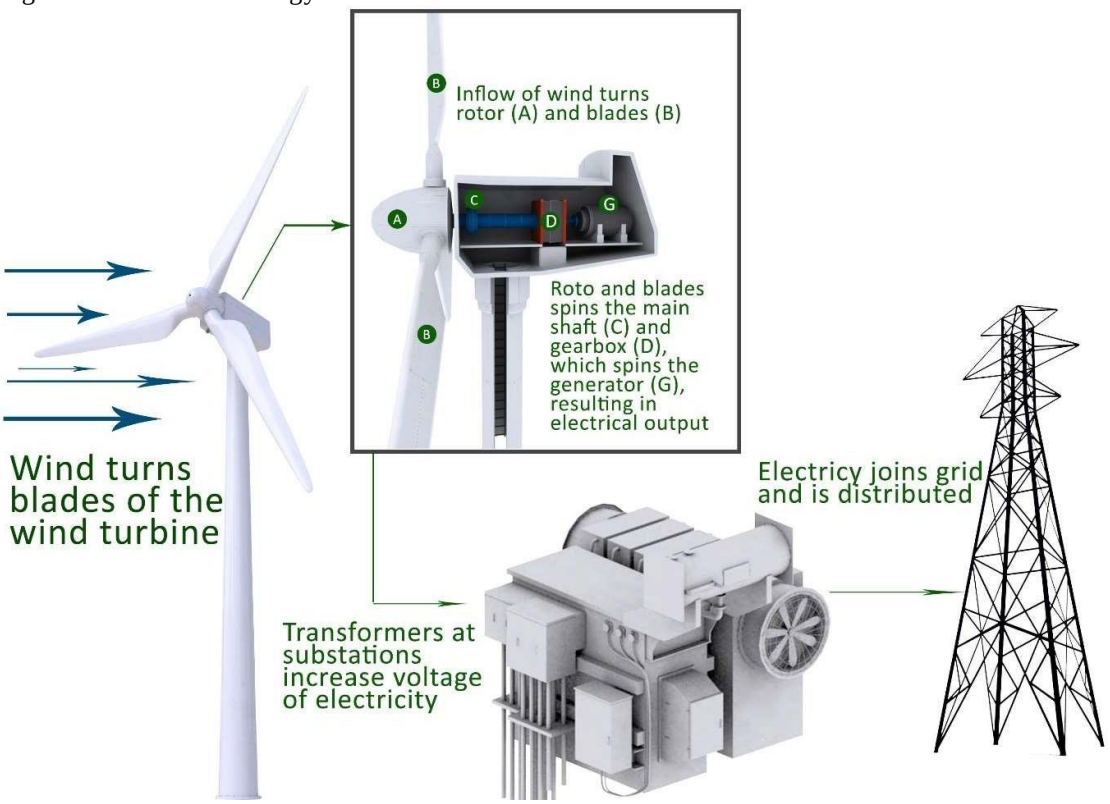
According to the 'Wind Energy Resource Atlas of the Philippines" by D. Elliot et al. "The best wind resources are found in six regions: (1) the Batanes and Babuyan islands north of Luzon; (2) the northwest tip of Luzon (Ilocos Norte); (3) the higher interior terrain of Luzon, Mindoro, Samar, Leyte, Panay, Negros, Cebu, Palawan, eastern Mindanao, and adjacent islands; (4) well-exposed east-facing coastal locations from northern Luzon southward to Samar; (5) the wind corridors between Luzon and Mindoro (including Lubang Island); and (6) between Mindoro and Panay (including the Semirara Islands and extending to the Cuyo Islands)."

As of now, most of wind farm sites are found in North Luzon, particularly in Ilocos Norte where the first wind power plant in Asia is located. Ilocos Norte alone has a potential of 300 to 400 wind power density (W/m2) @ 30). Similarly, World Wildlife Fund (WWF) in 2003 conducted a further study, in which power density, utility, and cost are considered. The study showed that Ilocos Norte has an estimated aggregate capacity of 265 MW and annual generation of 832 GHh.

To maximize the potential of wind energy resources, the Philippine government stated in the National Renewable Energy Plan (NREP) that there should be an additional 2,345 MW wind power by 2022. Likewise, the 57 indicative wind projects under review and those already awarded are expected to finish installation by 2022. Among the awarded wind projects that is currently developing, it is expected that the Cebu Wind Power Project, spearheaded by Ryanyx Construction & General Services Corp, will have the largest wind power capacity of 741 MW after installation.

As of June 2017, there is already 426.90 MW installed capacity, with potential wind capacity of 2,381.50 MW, making the Philippines the largest wind power generator among the ASEAN countries.

Figure 7. How Wind Energy Works



Accordingly, wind turbines are classified into two categories, namely, the vertical axis wind turbines and the most commonly used horizontal axis wind turbines. Likewise, wind turbines are available in variety of sizes. Utility-scale turbines range in size from 50 to 750 kilowatts. Single small turbines, below 50 kilowatts, are mainly used for homes, telecommunications, or water pumping.

In the wind industry today, continuous developments are being conducted and explored not only to enhance the efficiency of wind turbines but also to improve the installation process of wind turbines. As of now, most wind turbines are installed onshore, anchored on seabed with water depths not exceeding 30 meters. As such, one of the new technologies developed on wind energy is offshore wind turbine, which results to a more stable wind capacity unlike onshore where wind is intermittent. European countries are currently spearheading this development.

According to the DOE, a corporation is eyeing a 260-megawatt (MW) wind farm to be put up in Soccsksargen region particularly in General Santos City and Sarangani Province. Private companies

are taking interest into investing in wind resource on the eastern side of Mindanao particularly Surigao until General Santos City. There are also interests for Agusan-Surigao areas. Hangin Renewables Development Corporation is applying for a service contract for their 260MW project, which will be composed of three projects, the Mindanao 1 Wind Power Project, which will be put up in General Santos City, the Sarangani 1 Wind Power Project in Maasim, Sarangani and the Malungon Wind Power Project in Malungon, Sarangani. These areas are the eastern side of Mindanao, from up north Surigao until General Santos City.

The Siargao and Camiguin areas are already identified as an existing wind resource but only one to two turbines can be put up because the demand is not that huge.

The Philippine government promulgated Republic Act 9513 that outlines the policy that will accelerate the development of the Renewable Energy Sector in the country. This is to achieve energy self- reliance, adopt clean energy to mitigate climate change while promoting the socio-economic development of rural areas. The government gave fiscal and non-fiscal incentives to the possible investors. Fiscal incentives include Income Tax Holiday and Low-Income Tax Rate, Reduced Government Share, Duty-free Importation of Equipment and VAT-zero Rating, Tax Credit on Domestic Capital Equipment, Special Realty Tax Rate on Equipment and Machinery, Cash Incentive for Missionary Electrification, Exemption from Universal Charge, Payment of Transmission Charges, and Tax Exemption on Carbon Credits.

D. Advantages and Disadvantages of Wind Energy

Advantages
1. Renewable Aside from the fact that wind energy provides clean and renewable energy, wind power is inexhaustible. Wind is actually a form of solar energy. Winds are caused by the heating of the atmosphere by the sun, the rotation of the Earth, and the Earth's surface irregularities. For as long as the sun shines and the wind blows, the energy produced can be harnessed to send power across the grid.
2. Means of Rural Electrification Wind energy is now being used as a means of rural electrification in the Philippines. Many of the sites with good to excellent wind energy potential are rural areas in need of low-cost electricity.
3. Helps in Economic Development Wind farms also help in a rural area's economic development, given that locals are prioritized in job employments related to maintaining wind farms. Wind creates jobs. It provides jobs in manufacturing, installation, maintenance, and supporting services.
4. Will never run out Unlike fossil fuels and coal, wind will never run out and is assumed to release lesser carbon footprints. This helps in reducing the Philippines' dependence on nonrenewable-related greenhouse gas emissions that contributes to the escalating problem on pollution.

5. Clean and Green

Wind energy is a clean fuel source. Wind energy doesn't pollute the air like power plants that rely on combustion of fossil fuels, such as coal or natural gas. Wind turbines don't produce atmospheric emissions that increase health problems like asthma or create acid rain or greenhouse gases. According to the Wind Vision Report, wind has the potential to reduce cumulative greenhouse gas emissions by 14%, saving $400 billion in avoided global damage by 2050.

6. Does not use water

Wind power does not use water, unlike conventional electricity sources. Producing nuclear, coal, or gas-fired power uses water for cooling. Water is becoming a scarce resource all over the country. Wind power uses zero water in its energy generation.

8. Cost Effective

Wind power is cost-effective. It is one of the lowest-cost renewable energy technologies available today, with power prices offered by newly built wind farms averaging 2 cents per kilowatt-hour, depending on the wind resource and the particular project's financing. Even without government subsidies, wind power is a low-cost fuel in many areas of the country.

9. Can be built on existing structures

Wind turbines can be built on existing farms or ranches. This greatly benefits the economy in rural areas, where most of the best wind sites are found. Farmers can continue to work the land because the wind turbines use only a fraction of the acreage. Wind power plant owners make rent payments to the farmer for the use of the land, providing landowners with additional income.

10. Enormous Potential

As mentioned in the introduction of this article, the potential of wind power is absolutely incredible. Several independent research teams have reached the same conclusions: The worldwide potential of wind power is more than 400 TW (terawatts). Harnessing wind energy can be done almost anywhere. Whether or not a resource is financially feasible is another question.

11. Space-Efficient

The largest wind turbines are capable of generating enough electricity to meet the energy demand of 600 average U.S. homes. The wind turbines can`t be placed too close to each other, but the land in-between can be used for other things. This is why many farms would benefit more from installing wind turbines as opposed to solar panels.

Disadvantages

1. Wind fluctuations

The main problem on this renewable energy source is wind fluctuation. As such, it is very important to consider strategic locations in building wind power plant. Wind is a fluctuating (intermittent) source of energy and is not suited to meet the base load energy demand unless some form of energy storage is utilized (e.g. batteries, pumped hydro).

2. Cost Issues

On the other hand, although the benefit of a wind farm is generous, its cost issues remain the same. The cost of a wind farm exceeds those of the same coal-based power generation. To address this issue, the government subsidies taxes and give preferential feed-in-tariffs (FITs) and net metering.

3. Environmental Issues

Meanwhile, environmental issues also persist. According to a study made by The National Academies done in 2007, one of the main environmental concern in installing a wind farm is its impact on the aviation ecosystem. Turbines were found to cause fatalities in birds and bats. To address this issue, further research on collisions, relevant bird and bat behavior, mitigation measures were done. Although wind turbines contribute to the avian mortality, it is among the lowest contributor with buildings/windows and cat as the top reason of bird deaths.

4. Noise

Wind turbines are also said to produce noise though it is usually masked by the wind itself. In recent years, engineers have made design changes to reduce the noise from wind turbines. Early model turbines are generally noisier than most new and larger models. As wind turbines have become more efficient, more of the wind is converted into rotational torque and less into acoustic noise. Although noise pollution produced by wind turbines does not generally affect public health, it is still better to advise the local community by initiating open dialogue to affected areas. Proper siting and insulating materials can also be used to minimize noise impacts. Noise is a problem for some people that live in the proximity of wind turbines. Building wind turbines in urban environments should be avoided. Noise is not a problem with offshore wind turbines at all. New designs show significant improvements compared to older models and generate less noise.

5. Location of Wind Turbines

Turbines are mostly installed in open areas and is highly visible. Some studies concluded that wind turbines generally lower the aesthetic value in the immediate landscape. Although this is highly subjective, proper siting decisions can help to avoid negative aesthetic impacts to the landscape. One strategy being used to partially-offset visual impacts is to install fewer turbines in any one location by considering multiple locations and using today's larger and more efficient models of wind turbines.

6. Initial investment costs

The manufacturing and installation of wind turbines requires heavy upfront investments – both in commercial and residential applications.

7. Looks

While most people actually like how wind turbines look, there is always some who don`t. Wind turbines leave a smaller footprint on land compared to the majority of other energy sources (including solar, nuclear and coal). The problem is mitigated if the wind turbines are built outside urban areas.

8. Unpredictable

Wind is unpredictable and the availability of wind energy is not constant. Wind energy is therefore not well suited as a base load energy source. If we had cost-effective ways of storing wind energy the situation would be different. We can hope for breakthroughs in energy storage technologies in the future, but right now, wind turbines have to be used in tandem with other energy sources to meet our energy demand with consistency.

E. Challenges in the Renewable Wind Energy Sector

Although the results of the development in the wind energy sector is positive, it is not without barriers. According to DOE, there are five concerns being addressed: (1) technology, where wind-related technologies are set to be continuously updated; (2) commercialization, in which the goal is to make a market where the private sector can invest and participate; (3) promotion, in which the goal is to promote to the public the advantages of developing the wind energy sector; (4) policy, where the development of the wind energy sector is maintained with the help of laws and policies governing it; and (5) Area Based Energy, wherein the goal is to improve and accelerate development in rural areas.

Since the Philippines is a developing country, project financing is also a concern in advancing not only the wind energy sector but the whole renewable energy industry. As such, the government started a policy to lower investment costs and enhance the competitiveness of the market, making it viable for the investors to capitalize.

The project appraisal conducted by The World Bank also listed four key variables that can impact a wind project:

1. Power Production
2. Power Price
3. Project Cost
4. Project Financing

From then on, the wind energy sector had a continuous rise in power generation.

In line with this, construction of renewable energy power plants accompanies issues on social acceptability, capital-intensive investments, right of way for the distribution lines, and proximity to utility grids. To resolve the issue on the community's possible opposition to power plants, getting the support and cooperation of the LGUs and a decent corporate social responsibility plan is key to address the concerns of the people. Meanwhile, a security risk assessment and other studies must be conducted in order to address the said technical aspects and some environmental issues concerning the locality. These security issues should be properly addressed and included in the business development plan.

Wind power must compete with conventional generation sources on a cost basis. Depending on how energetic a wind site is, the wind farm might not be cost competitive in less windy areas of the country. Even though the cost of wind power has decreased dramatically in the past 10 years, the technology requires a higher initial investment than fossil-fueled generators.

Good wind sites are often located in remote locations, far from cities where the electricity is needed. Transmission lines must be built to bring the electricity from the wind farm to the city. According to the American Wind Energy Association, approximately 51,000 MW of new wind capacity could be added if near-term transmission projects in advanced development are completed.

Turbines might cause noise and change the viewshed. Although wind power plants have relatively little impact on the environment and communities compared to conventional power plants, concern exists over the sound sometimes produced by the turbine blades and visual impacts to the landscape.

Though wind turbines harm wildlife less than some conventional sources of electricity, turbine blades could damage local wildlife. Electricity generation that pollutes the air and water causes wildlife fatalities through acid rain, mercury poisoning, habitat disruption due to warming temperatures, and more. However, birds have been killed by flying into spinning turbine blades. Blade strikes have been greatly reduced through technological development or by properly siting wind plants.

Currently, the National Renewable Energy Laboratory's National Wind Technology Center (NWTC) is supporting wildlife technology research validation designed to reduce bird and bat fatalities at wind

energy projects. The research provided at the NWTC will serve as a pipeline to the American Wind Wildlife Institute's technology verification program and similar efforts aimed at supporting commercialization of these products.

Wind power only accounts for about 2.5% of total worldwide electricity production, but is growing at a promising rate of 25% per year (2010).

Although wind power only accounts for about 2.5% of total worldwide electricity production, the capacity is growing at an incredible rate of 25% per year (2010). This does not only contribute in the fight against global warming, but also helps lowering costs.

IV. OPPORTUNITIES FOR NEW ZEALAND COMPANIES

Philippine President Rodrigo Duterte has issued Executive Order (EO) No. 5 providing for the adoption of "Ambisyon Natin 2040." It is a 25-year, long-term vision for development planning, which was signed last 11 October 2016. The 25-year plan anticipates a Philippines that is a "prosperous, predominantly middle-class society where no one is poor." Ambisyon 2040 just opened a wide range of opportunities for the Philippine energy sector because the Secretary of the Department of Energy (DOE) said that the Philippines is going to build the energy supply for the infrastructure sector – in line with the government's ambitious infrastructure program labeled "Build Build Build." The Duterte administration recently unveiled a three-year rolling infrastructure program amounting to PHP 3.6 trillion (NZD 98.5 billion) from 2018 to 2020, dubbed as the country's "golden age" of infrastructure.

To support Ambisyon 2040 development plan, the country needs 17,300 megawatts, from 2016 to 2030. An additional power of 26,000 MW from 2030 to 2040 or a total of 43,000 MW from 2016 to 2040 is needed to support the country's infrastructure projects.

Now, the DOE is optimistic that investors will come in as investment opportunity is open for all and the DOE will not put a cap and quota on the energy source of choice, thus New Zealand companies in the renewable energy sector can invest. The DOE are looking for new players in the market who can offer the best for the country and investors who can provide the supply in the most cost effective and the most efficient way.

Table 7 summarizes the awarded RE projects as of 30 June 2017. It is good to note that there is a total of 831 projects awarded (grid-use and own-use) with a potential capacity of 21,937 MW and an installed capacity of 4,710.97 MW.

Table 7. Awarded Projects Under Renewable Energy (RE) Law, as of 30 June 2017

RESOURCES	AWARDED PROJECTS		POTENTIAL CAPACITY MW		INSTALLED CAPACITY MW	
	Grid-Use	Own-Use	Grid-Use	Own-Use	Grid-Use	Own-Use
Hydropower*	445	-	13,419.73	-	965.04	-
Ocean Energy	6	-	26.00	-	-	-
Geothermal**	41	-	575.00	-	1,906.19	-
Wind	62	1	2,381.50	-	426.90	0.006
Solar	186	16	5,181.67	4.286	900.18	3.218
Biomass	51	23	326.68	23.07	389.58	119.86

Sub-Total	791	40	21,910.58	27.356	4,587.89	123.08
TOTAL	831		21,937.94		4,710.97	

NOTE: * - excluding 55 installed projects with 3,050.47MW capacity under RA 7156, CA 120, PD 1645, RA 3601 & Own-Use ** - excluding 1 potential project with 20MW capacity under PD 1442
Source: DOE

Meanwhile, Table 8 lists the pending RE projects totaled 341 with a potential capacity of 4,697.37 MW. Biggest potential capacity will come from hydropower, followed by solar power.

Table 8. Pending Projects Under RE Law, as of 30 June 2017

RESOURCES	PENDING APPLICATIONS		POTENTIAL CAPACITY MW		INSTALLED CAPACITY MW	
	Grid-Use	Own-Use	Grid-Use	Own-Use	Grid-Use	Own-Use
Hydropower	93	-	2,270.67			
Ocean Energy	-	-	-	-	-	-
Geothermal	3	-	60.00	-	-	-
Wind	22	-	80.00	-	-	
Solar	210	-	2,114.70	-	-	-
Biomass	13	-	172.00	-	-	-
Sub-Total	341	-	4,697.37	-	-	-
TOTAL	341		4,697.37		0.00	

Source: DOE
Below is the list of all awarded projects on hydropower with at least 500 MW capacity.

Table 9. List of awarded hydro projects with potential capacity of 500 MW or more

Location	Project Name	Company Name	Potential Capacity MW
Itogon, Benguet	San Roque Upper East Pump Storage	Strategic Power Devt Corp	600
Kibungan, Benguet	Kibungan Pump Storage	Coheco Badeo Corp	500
Kibungan, Benguet	Kibungan	Kibungan Hydropower Corp	1,000
Cabarroguis & Nagtipunan, Apayao	Gened 1	Pan Pacific Renewable Power Philippine Corp	600
Dingalan, Aurora	Dingalan Pump Storage	Strategic Power Development Corp	500
Jalajala, Rizal	Jalajala Pump Storage	Citicore Power Inc	750
Rodriguez, Rizal	Wawa Pump Storage 1	Olympia Violago Water & Power Inc	500
Kalayaan, Laguna	Kalayaan Pump Storage	Citicore Power Inc	600

Source: DOE

Table 10. List of awarded wind projects with potential capacity of 100 MW or more

Location	Project Name	Company Name	Potential Capacity MW
Pasuquin & Burgos, Ilocos Norte	Pasuquin East Wind Power Project	Energy Logics Philippines, Inc.	132.00
Pagudpud, Ilocos Norte	Balaoi Wind Power Project	Bayog Wind Power Corp. (formerly North Luzon Renewable Energy Corporation)	150.00
General Nakar and Infanta Quezon	Wind Power Project	Energy World Kanan River Inc.	200.00
Argao-Dalaguete-Alcoy-Baljoon-Oslob, Cebu	Cebu Wind Power Project	Ryanyx Construction & General Services Corp.	741.00

Source: DOE

A. Business Opportunities

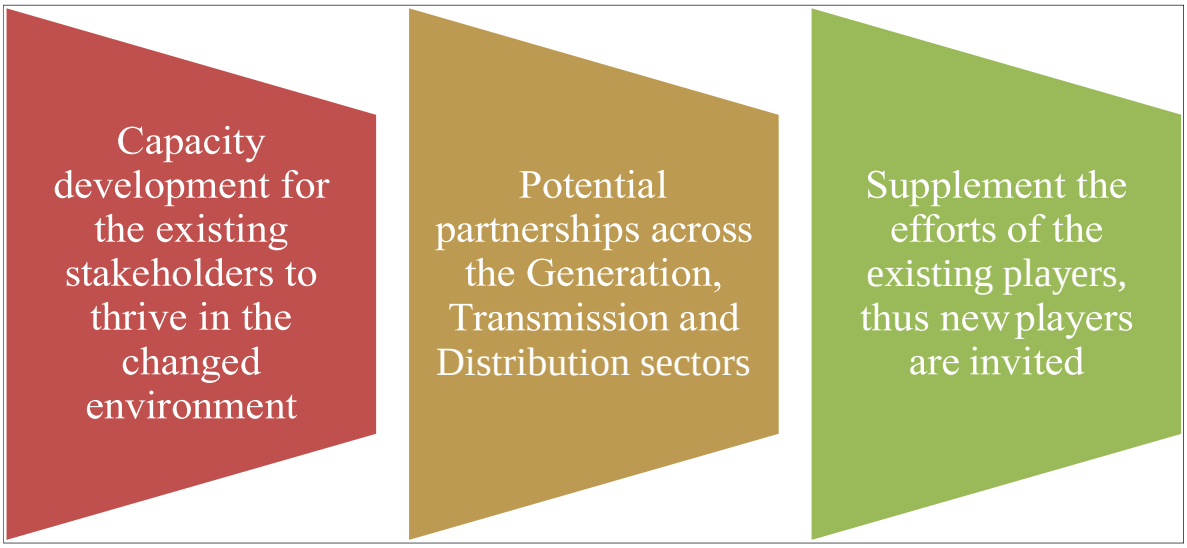
The Philippine power sector as a whole offers a lot of great opportunities for the private sector (both domestic and international) in the coming years.

In the generation sector, capacity addition of over 13GW, coupled with setting up of high capacity interconnectors between different parts of this huge archipelago, would mean large opportunities for investment by the private sector.

The DOE estimates an aggregate investment opportunity of about USD 25 billion (NZD 35 billion) until 2030. The opportunity is clearly big and the sector has the players who could potentially handle that level of investment requirements. However, there will still be a need for:

- Capacity development for the existing stakeholders to thrive in the changed environment
- Potential partnerships across the Generation, Transmission and Distribution sectors
- Likelihood for new players to enter the competitive markets in the Philippines to supplement the efforts of the existing ones
- Philippine power companies moving to other competitive markets like Singapore, Australia and UK to learn and leverage their expertise like Meralco and First Pacific buying 70 percent stake in 800MW Combined-Cycle Gas Turbine or CCGT in Singapore

Figure 8. Initial Opportunities in a nutshell.



The Philippine power sector is undergoing a huge transformation that offers opportunities but also high risks that need to be managed. Existing stakeholders would have to reorient themselves to be successful in this new environment.

The Philippines strongly commit to developing its renewable energy resources, especially its wind and solar power. The country is in an ideal position for generating renewable energy. Its tropical, archipelagic setting along the monsoon belt in the western Pacific provides the country immense potential for greener energy. The Department of Energy (DOE) reports a technical potential of 7404 MW of wind energy and nearly 300,000 sq km of land for solar energy throughout the Philippines, which would be sufficient for the country's baseload requirements.

Given this tremendous potential, the Philippines must capitalize on attracting investments in its renewable energy sector, which grows faster than any other source. As rising temperatures threaten the country's water bodies and its hydroelectric capacity, it is especially important to promote its wind and solar power industry. While solar, wind, and biomass energy production has increased nearly four-fold from 2014 to 2016, it still comprises only 1.5 percent of total energy production.

Figure 9. Summary of other opportunities for New Zealand companies

Supply of Equipment

New Zealand companies involved in renewable energy generation can supply equipment especially in the hydro and wind power sectors – as the Philippines is still studying on how to maximize resources in these subsectors. For instance, the generation of renewable energy requires specialized equipment that are not locally manufactured. As a result, private stakeholders involved in the renewable energy sector must import such equipment from other nations before commencing their operation of renewable power plants in the country.

Technology Solutions

New Zealand companies with expertise in tidal and wave energy can provide technology transfer to local companies. Under NREP, the first tidal power plant was expected to be fully operational by 2018 and four contracts have been awarded since 2015. This provides opportunities for cross-border partnerships since the sector is relatively undeveloped in the Philippines.

Related services in developing green energy infrastructure projects

As the power sector expands, the Philippines will need related services in developing green energy infrastructure. For example, the wind systems in the Burgos wind project (0.150 GW in capacity) are supplied by Danish company Vestas.

Public-Private Partnerships (PPPs) for renewable energy

The government established more public-private partnerships (PPPs) for renewable energy. Creating such partnerships would allow the government to offload investment costs and utilize the expertise of the private sector player, who in turn can give more efficient services and assets pertaining to renewable energy while generating profit from such ventures. Foreign companies can participate together with a local company.

To propel more PPPs in the Philippines, appropriate legislation may be passed to increase incentives for private firms investing in renewables or remove economic restrictions to attract more foreign investors to the country. Opening the market to new local and foreign players, especially during the bidding process, may spur further development of cleaner energy resources. This can also lead to a decrease in local renewable energy production costs for consumers, which has long been cited as one of the major obstacles against its development. It must also make the bureaucratic process for approving projects more efficient and transparent, considering that the country ranks low in the ASEAN on foreign direct investments.

Research and Development Support

The Philippine government should invest in developing its local science and technology (S&T) sector. By providing financial support to research conducted by local experts regarding green energy technologies, the country is establishing a strong foundation to propel its long-term development.

Technical Advice from Foreign Experts

The Philippines should also seek technical advice from nations that have successfully implemented large-scale renewable energy projects like New Zealand. It would be good to analyze cases of how other countries overcame financial or logistical issues similar to those that the Philippines faces. For instance, countries such as Japan and Italy are among the world's leading solar energy producers despite having similar total land areas with the Philippines. Japan can provide innovative solutions to overcome another potential obstacle to solar power growth in the Philippines.

B. OPERATION REQUIREMENTS

Building power plants entail potential dangers to people and the environment. Hence, high level of safety and security is needed, beginning in construction measures to its operations and maintenance.

Generally, the Renewable Energy Act of 2008 encourages investors and energy producers to build renewable energy power plants by giving fiscal and non-fiscal incentives. This is to speed up the development and utilization of renewable energy in the country. Accordingly, National Renewable Energy Board (NREB) is mandated, under RA No.9513, to act as the primary consultative and

Incentives from the Renewable Energy Act of 2008 (Act No. 9513)

- An income tax holiday for the first seven years of commercial operations.
- Duty-free importation of renewable energy machinery, equipment and materials.
- Special realty tax rates on equipment and machinery where renewable energy facilities shall not exceed 1.5% of their original cost, less accumulated normal depreciation or net book value.
- A net operating loss carryover to renewable energy developers in the first three years after the start of commercial operation.
- A guarantee that if the renewable energy project fails to receive an income tax holiday before full operation, it may apply for accelerated depreciation (declining balance method or sum-of-the year's digit method) in its tax books.
- A provision ensuring that the sale of fuel or power generated from renewable sources of energy and other emerging energy sources using technologies such as fuel cells and hydrogen fuels shall not be subject to value-added tax (VAT).
- A provision that entitles renewable energy developers to zero-rated value-added tax on its purchases of local supply of goods, properties and services needed for the development, construction, and installation of its plant facilities.
- A provision that makes all proceeds from the sale of carbon emission credits exempt from all taxes.
- A tax credit equivalent to 100% of the value of the value-added tax and custom duties on the renewable energy machinery, equipment, and materials.

recommendatory body in relation to the implementation of the mechanisms under the Renewable Energy Act of 2008. Likewise, the RPS includes amendments to the Renewable Energy Act of 2008 to be considered by renewable energy developers.

Developing Hydropower Plants

In developing hydropower plants, provisions under Republic Act No. 7156, otherwise known as the Mini-Hydroelectric Power Incentives Act, can be considered. This RA concludes the Rule and Regulations Governing The Filing Processing Of Applications For Authority To Construct And Operate Mini-hydroelectric Power Plants And Providing For The Terms And Conditions Of The Operating Contracts.

Some of the specific obligations of the developer under RA No. 7156 include the following:

- The developer must be responsible for the legal requirements upon application and construction of the hydropower plant. Provisions of laws relating to labor, health, safety, and ecology must be considered in general application.
- Approved proper field practices using modern and scientific methods must be applied and observed to ensure the maximum economic production and avoid hazards to life, health, and waters. DENR's forestry rules, regulations, and rehabilitation, against illegal logging and other types of forest destruction, on watershed areas must also be adhered.
- Developers shall also maintain technical and financial records and accounts of its operations.
- Developers must adhere to regulations, especially with regard to the safety of the people and environment, and ensure non-interference of other operations near the power plant site. In cases that the proposed hydropower plant development required stoppage of existing water outlets, passageways and the likes, the developer will be responsible on reconstruction and restructuring.
- Meters and measuring equipment as well as the hydropower plant facilities and sites must be maintained accessible to authorized Office of Energy Affairs (OEA) inspectors. OEA shall also be allowed to inspect the power plant during and after its operations and must be provided with documents required for proper monitoring and planning purposes. Likewise, Bureau of Internal Revenue (BIR) and authorized OEA personnel must be allowed to check accounts, books, and records relating to the mini-hydropower operations for tax and other fiscal operations.
- A quarterly report on electricity generation of the hydropower plant must also be submitted to OEA to ensure the maximum efficiency of its operations.
- It shall install necessary and sufficient protective devices at the power plant to ensure safe and unperturbed operation of the local electricity network to which the plant is interconnected. In line with this, the developer must negotiate on the provision of interconnection with either NAPOCOR, the local electric cooperative grid or utilities. It shall also first offer to sell electric power to either NAPOCOR, franchised private electric utilities or cooperatives, and provide a copy of the sales contract with buyer to OEA.
- Developer must also seek approval and consent from OEA for any major changes in its work plan. OEA has the right to verify the adherence of hydropower plant to the standards it declared during construction and operations.
- Developer must also prioritize employing and hiring qualified Filipino nationals in operations. Schooling and training assistance of Filipino staff must be funded by developers as required by OEA.

Meanwhile, there are also necessary permits and licenses required for mini-hydropower projects according to the Guidebook on Renewable Energy Project Development and Packaging.

1. Mini-Hydroelectric Power Non-exclusive Reconnaissance Permit (OEA Office Circular No. 92-11-23) from DOE
2. Mini-Hydroelectric Power Development and Operating Contract from DOE
3. Water Rights Permit from the National Water Resources Board
4. Environmental Compliance Certificate (ECC) from DENR
5. Initial Environmental Examination (IEE) Report from DENR
6. Environmental Impact Statement (EIS) Report from DENR
7. National Commission on Indigenous Peoples (NCIP) Certification
8. Free Prior and Informed Consent (FPIC) from indigenous people
9. Certificate of Compliance from the Energy Regulatory Commission
10. Power Purchase Agreement with electric cooperatives/distribution utilities
11. Permit on Navigable or floatable waterways from the Department of Public Works and Highways
12. Endorsement of Local Government Units

Developing Wind Power Plants

Currently, there is no existing law that specifically regulates the development of wind power plants in the Philippines. Nevertheless, the NREB's operation rules and requirements apply on all RE power plants.

Table 11. Partial list of required permits, licenses and certificates for RE project application

Required Documents issued by the National Government	Required Documents issued by the Local Government Units (LGUs)
1. SEC Registration 2. DOE Certificate/Endorsement 3. DOE Accreditation 4. BOI Registration 5. CSR Approval — Anti-poverty Commission 6. DENR EPC Certificate 7. DENR Environmental Certificate (ECC) 8. DENR Permit to Operate 9. Development Permit (endorsed to LGU) 10. Transfer Certificate of Title (LRB, HLURB) 11. BIR Certified Tax Declaration 12. ERC Certificate of Compliance 13. NTC Permit to Purchase 14. NTC License to operate 15. ERC Compliance to Grid Code 16. ERC Compliance to Distribution Code 17. WESM Registration 18. Right of Way permit 19. Power Purchase Agreements 20. Certificate of Registration as Importer	1. LGU Endorsements (Governor, Mayor, Councils) 2. Realty Tax 3. Barangay Clearance to operate 4. Business and Operations Tax 5. Building permit 6. Real Estate Tax Receipt 7. Sanitary Permit 8. Barangay Clearance for Construction 9. Right of Way permits 10. Water Rights

C. LABOUR MARKET RATE

Below is a list of workers involved with the construction and maintenance of a power plant with their corresponding estimated labor rates:

Table 12. Labour rate in Philippine Peso

Position	Average Annual Salary	Bonus Rate	Total Salary Range	Additional Notes
Maintenance Technician	PHP 101, 367 to PHP 414,257	PHP 20,000	PHP 96,958 to PHP 402,223	
Project Architect	PHP 185,153 to PHP 720,000	PHP 5,152 - PHP 155,133	PHP 184,281 – PHP 774,902	with Profit sharing of PHP 55,000
Construction Foreman	PHP 164,160			
Construction Manager	PHP 264,000 to PHP 1,393,548	PHP 20,111 to PHP 278,122	PHP 264,000 to PHP 1,610,000	Profit sharing amount average of PHP 123,000
Project Engineer	Hourly Rate of PHP 64.42 with overtime pay that varies from PHP 60.82 to 251.68.	PHP 3,452 to PHP 98,916	PHP 146, 515 to PHP 594,558	Profit Sharing rate varies from PHP 0.00 to PHP 242,395
Project Manager, Construction	PHP 270,000 to PHP 2,400,000	PHP 23,919 to PHP 496,208		
Project Manager			PHP 290,874 to PHP 2,391,988	Profit sharing in amount of PHP 100,000
Mechanical Engineer	PHP 300,000			
Assistant Project Manager, Construction	PHP 396,000			
Electrical Engineer	Hourly Rate ranges from PHP 37.75 to PHP 722. Overtime pay varies from PHP 50.00 to PHP 350.00	PHP 4,880 - PHP 200,000	PHP 156,324 up to PHP 736,578	Profit Sharing is from PHP 0.00 to PHP 100,000
Electrician	Hourly rate of PHP 78.11; overtime pay varies from PHP 23.25 to PHP 1,600	PHP 15,260	PHP 220,060 to PHP 1,890,876	
Welder	Average monthly salary of PHP 25,000			
Construction Laborer/Helper	minimum salary of PHP 350 to PHP 450 a day			

Source: DOLE

Table 13. Labour rate in New Zealand Dollar

Position	Average Annual Salary	Bonus Rate	Total Salary Range	Additional Notes
Maintenance Technician	2,737 to 11,185	540	2,618 to 10,860	

Project Architect	5,000 to 19,440	140 to 4,200	5,000 to 21,000	with Profit sharing of 1,500
Construction Foreman	4,435			
Construction Manager	7,130 to 37,626	543 to 7,510	7,128 to 43,470	Profit sharing amount average of 3,321
Project Manager, Construction	7,290 to 64,800	646 to 13,400		
Project Manager			7,900 to 65,000	profit sharing in amount of 2,700
Mechanical Engineer	8,100			
Assistant Project Manager, Construction	10,700			
Electrical Engineer	Hourly Rate 20	132 to 5,400	4,300 to 20,000	Profit Sharing is from 0 to 2,700
Electrician	Hourly rate of 2.10; overtime pay 43.2	412	6,000 to 51,000	
Welder	Average monthly salary of 675			
Construction Laborer/Helper	minimum salary of 9.45 to 12.15 a day			

Source: DOLE

V. POTENTIAL PARTNERS, DEVELOPERS AND CONTRACTORS

Building renewable power plants require competent partners that will oversee and monitor its construction. As such, some of the recognized developers in and near the Philippines are listed below:

A. Contractors

Company	JGC Philippines
Address	JGC Philippines Building, 2109 Prime Street, Madrigal Business Park Ayala Alabang, Muntinlupa City, Philippines
Telephone	+63 2 876 6119
Fax	+ 63 2 807 5977
Email	marketing@jgc.com.ph
Website	www.jgc.com
Brief Description	It is granted with "AAAA" Philippine Contractors Accreditation Board (PCAB) License due to its proven construction solutions at the shortest schedule while adhering to safety and loss prevention. Services include construction supervision, safety control, quality control, material control, field engineering, testing, and commissioning. It also extends facility maintenance services, backed by proven engineering technology and extensive experience on the power generation sector.
Contact Person	Carol Rivera, Senior Sales Engineer carol.rivera@jgc.com.ph +63 2 842 7220 loc 10710

Company	McConell Dowell Creative Construction
Address	Level 4 NOL Tower, Madrigal Business Park Commerce Avenue Alabang, Muntinlupa City, Philippines
Telephone	+632 809 6328
Fax	+632 809 6331
Email	phil@mcdgroup.com
Website	www.mcconnelldowell.com
Brief Description	It is granted with "AAA" PCAB License that is valid for civil, structural, building, mechanical, and electrical works
Contact person	Bruno Tirrizzi, Country Manager

Company	Marubeni Philippines Corporation
Address	36th Floor, Tower One, The Enterprise Center, 6766 Ayala Avenue cor. Paseo de Roxas, Makati City, Philippines
Telephone	+63 2 886 5300
Fax	+ 63 2 886 5310
Email	descalzo-a@marubeni.com
Website	http://www.sanroquepower.ph
Brief Description	Marubeni Philippines Corporation's Power Department represents the company's interests in the power sector that range from power purchase agreements (PPA) and energy conversion agreement (ECA)-based independent power producer (IPP) projects, to engineering procurement and construction (EPC)-turnkey power plant construction projects funded by official development assistance and various multilateral export credit agencies.

Contact person	Kenshi Iseri, Executive Vice President kenshi-i@marubeni.com

Company	Phil-Nippon Kyoei Corporation
Address	Suite 705 Royal Plaza Twin Towers 684 Remedios St. Malate, Manila, Philippines
Telephone	+63 2 400 5778; 328 3270
Fax	+63 2 400 9130; 310 0649
Email	inquiry@philnippon.com.ph
Website	http://www.philnippon.com.ph
Brief Description	PNKC is a niche player in the power industry. It has the resources, technology, and organization to undertake Build-Own-Operate (BOO) projects ranging from 100 KW to 40 MW base-load demand capacities for industrial manufacturers, and to engage in power sales agreement. PNKC's initial niche is in heavy industries that require their own power source.
Contact person	Jonathan Cervo Industrial Sales Engineer

Company	EEI Corporation
Address	12 Manggahan, Bagumbayan, Lungsod Quezon, 1110 Kalakhang Maynila
Telephone	+63 2 6350843 +63 2 6350851
Fax	+63 2 635 0861
Email	aspascua@eei.com.ph
Website	https://www.eei.com.ph/
Brief Description	EEI Corporation is recognized as one of the leading construction companies in the Philippines, known for the quality of its work and the excellence of its workforce. It has the broadest range of construction and engineering services, with expertise in the construction of large-scale heavy and light industrial projects, infrastructure, and property development projects all over the world.
Contact person	Antonio S. Pascua Executive Vice President, Construction

Company	Sta Clara International Corporation
Address	Highway 54 Plaza 986 EDSA Wack-Wack Mandaluyong City
Telephone	408 638 0120
Fax	408 279 2044
Email	info@staclara.com.ph; elmoanselmostaclara@gmail.com
Website	www.staclara.com.ph
Brief Description	Sta. Clara is one of the leading full-service engineering, construction, development and management enterprises in the Philippines, with overseas operations, serving the power and utilities, infrastructure and civil engineering sectors.
Contact person	Engr Elmo Anselmo

Company	Betonbau Construction
Address	Salcedo Bldg., Severina Avenue, Severina Subd., KM 18 South Superhighway, Parañaque City, Philippines 1700
Telephone	+63 2 824 3321 +63 2 824 3593
Fax	+63 2 8245366 +63 2 8210120
Email	betonbau@betonbauphil.com; engineering@betonbauphil.com; bbpi.optns@gmail.com
Website	www.betonbauphilinc.com
Brief Description	The scope of works being offered include Fast Phase High-End Factories, Massive Concrete Structure, Specialized Concrete Structures such as Silos, Oil Platforms, Intake Tanks, Water & Sewage Tanks, Culverts, Concrete Girders and the like.
Contact person	Engr Joseph Nieva josephnieva65@yahoo.com

Company	Structural Engineer Sy^2 + Associates
Address	Unit 504, Pryce Center, 1179 Don Chino Roces Ave cnr Bagtikan St, Makati City 1231, Philippine
Telephone	+63 2 896 9704 / +63 2 896 9705
Fax	+63 2 896 9760 / +63 2 896 9761
Email	info@sysquared.com
Website	www.sysquared.com
Brief Description	SY^2 + Associates Inc. is a privately held structural engineering firm based in the Philippines that specializes on providing cost-effective and innovative structural design solutions.
Contact person	Engr Wilson A. Sy Vice President

Company	Megafoundation International Corporation
Address	29 McArthur Hwy, Brgy Abanangan Norte, Marilao, Bulacan 3019, Philippines
Telephone	63 44 815 0055 / 63 44 815 1730
Fax	63 44 815 0055
Brief Description	Piling & Foundation Contractor Megafoundation International Corporation has been conceived by engineers with wide range of experience in pre-casting, pre-stressing and post tensioning applications. It was established on October 17, 2011 and became fully operational in the production of pre-stressed/pre-cast concrete structural members. Its main plant has 4.907 hectares area located in #029 MacArthur Highway, Brgy. Abangan Norte, Marilao, Bulacan. In February 2012, the company has its first project with the Tiger Resort, Leisure and Entertainment, Inc. and it is located at Manila Bay Resorts, Brgy. Tambo and Dongalo, Parañaque City.
Contact person	Engr Jerry K. Del Rosario General Manager

Company	BF METAL CORPORATION/BF CONSTRUCTION
Address	Km 17 Ortigas Ave Ext, Cainta, 1900 Rizal, Philippines
Telephone	+63 2 656 0513
Fax	+63 2 656 0614
Mobile	+63 917 6282728
Email	bayani.fernando@bfmetalcorp.com
Website	https://www.bfmetalcorp.com/
Brief Description	Fabrications and Erection of Steel Components for the following: • Structural Steel for High Rise Buildings • Industrial Plants, Power Plants, Oil & Gas and Chemical Plants • Mining and mineral Exploration Processing Plants • Warehouses and Factory Buildings • Bridge Sections / Steel Frames • Tunnel Formworks •Elevated / Storage Steel Tanks • Fuel Tank Relocation and Pipelines • Open Framed structural Steelwork • Telecommunication and Surveillance Towers • Conveyors and Hopper • Bailey Bridge/Detour Bridge • Anchor Bolts • Hydro Gates and Doors
Contact person	Bayani Fernando President and CEO

Company	K-Water resources
Address	2, F 808 Bldg., General Lim, Cor., Meralco Ave., Pasig, Metro Manila
Telephone	+65 6595 6303
Email	2170289@kwater.or.kr
Website	www.kwater.or.kr
Brief Description	K-water has been always at the forefront by improving the economy and the quality of life through efficient development and management of water resources. K-water is securing water resources through a systematic water management and preparing for natural disasters.

Company	EM Cuerpo
Address	No. 3 Metropoli Drive, Brgy Bagumbayan, Quezon City, Metro Manila 1110
Telephone	+63 2 6378333
Fax	+63(2)6874541
Email	emcuerpocareers@gmail.com
Website	www.emcuerpo.com
Brief Description	E. M. Cuerpo, Inc. seeks to expand and diversify its services from general building design and construction to include not only steel fabrication but also in the field of real property development, mass housing and other specialty services.

B. Power Partners

Company	AVGarcia Power Systems Corp.
Address	Suite 7GHI, 20 Lansbergh Place, 170 Tomas Morato Ave., Quezon City, Metro Manila, Philippines
Telephone	+63 2 372 9247
Fax	+63 2 374 6455
Email	info@avgarciapowersystems.com
Website	www.avgarciapowersystems.com/
Brief Description	AVGPSC offers a range of engineering and consultancy services for power generation. These include design, installation, construction, engineering, project development services, site survey and assessment services, financial services, and contractor services.

Company	Aboitiz Power Corp.
Address	NAC Tower, 32nd Street, Bonifacio Global City 1634 Taguig City, Metro Manila, Philippines
Telephone	+63 2 886 2800
Fax	+63 2 817 3560
Email	www.aboitizpower.com/AP/index.php
Website	https://aboitizpower.com/
Brief Description	Aboitiz Power is the holding company for the Aboitiz Group's investments in power generation, distribution, and retail electricity services. It is a publicly listed holding company that, through its subsidiaries and affiliates, is a leader in the Philippine power industry and has interest in a number of privately-owned generation companies and distribution utilities.
Contact person	Antonio Moraza, President
	Erramon I. Aboitiz, CEO

Company	Liebherr
Address	Nearest to the Philippines) Location: No. 8 Pandan Avenue 609384 Singapur, Singapore
Telephone	+65 6266 5223
Fax	+65 6265 2305
Mobile	+639 338 540893
Email	info.lsi@liebherr.com
Website	www.liebherr.com
Brief Description	Liebherr offers quality-products, especially mobile crane and crawlers, and various services related to construction. It also offers rental machines and vehicles for a wide range of requirements, including services such as consultation, staff training, and logistics if desired.

Company	First Gen
Address	6/F Rockwell Business Center Tower 3 Ortigas Avenue, Pasig City 1604 Philippines
Telephone	+63 2 449 6400

Fax	+63 2 637 8366
Email	info@firstgen.com.ph; investorRelations@firstgen.com.ph
Website	http://www.firstgen.com.ph/contactus/
Brief Description	First Gen is a subsidiary of First Philippine Holdings Corporation (FPH), one of the oldest and largest conglomerates in the Philippines, that has interests in power generation, power distribution, infrastructure, manufacturing, and property development.
Contact person	Ms. Valerie Y. Dy Sun Vice President and Head of Investor Relations

Company	AES Transpower
Address	18th Floor, Bench Tower, 30th st. corner Rizal Drive, Cresent Park West 5, Fort Bonifacio Global City, Taguig, Philippines
Telephone	+63 2 459 2600
Email	corporate.affairs@aes.com
Website	http://www.aes.com/sustainability/sustainability-overview/default.aspx
Brief Description	AES not only expanded its footprint in Asia. It also demonstrated its deep local knowledge and distinctive operational skills – honed from more than two decades of leadership in the global energy sector and pioneering advances in many markets.
Contact persons	Jon Julian Assistant Vice President for Markets gonzalo.julian@aes.com Shimri Rodelas Director for Market Development shimri.rodelas@aes.com

Company	SEM Calaca Power Corporation
Address	2nd Floor, DMCI Plaza Building, 2281, Don Chino Roces Extension, Barangay Magallanes, Makati City, Metro Manila
Telephone	+63 2 888 3624
Fax	+63 2 888 3955
Email	avte@dmcipower.com
Website	http://www.semirarampc.com
Brief Description	SEM-Calaca Power Corp. engages in electricity generation. The company owns and operates coal fired power plant. The company was incorporated in 2009 and is based in the Philippines. SEM-Calaca Power Corp. operates as a subsidiary of Semirara Mining Corp.
Contact person	Victor A. Consunji President, Chief Operating Officer, and Director

Company	Global Business Power Corp.
Address	22nd Floor, GT Tower International 6813 Ayala Avenue Corner H.V. dela Costa Street 1227 Makati City, Philippines

Telephone	+03 2 322 5803
Fax	+03 2 322 6428
Email	Glen.Buising@globalpower.com.ph; Clarissa.Dizon@globalpower.com.ph
Website	www.gbpc.com.ph/
Brief Description	Global Business Power Corporation (GBP) is a holding company which, through its subsidiaries, is a leading independent power producer in the Visayas region and Mindoro island, with a combined gross maximum capacity of 854 MW.
Contact person	Jaime T. Azurin President Jaime.Azurin@globalpower.com.ph

Company	SPC Power Corporation
Address	7th Floor, Cebu Holdings Center, Cebu Business Park, Cebu City, Cebu, Philippines
Telephone	+63 32 231 9372
Email	spc@unet.net.ph
Website	http://www.spcpowergroup.com/
Brief Description	Salcon Philippine Corporation is authorized to primarily engaged in the design, construction, rehabilitation, operation, maintenance and management of power generation, supply and distribution of plants and related facilities. SPC chairman Alfredo Henares said the company has remained upbeat on its outlook of the energy sector, seeking new opportunities in renewable energy projects including hydro, geothermal and biomass power plants.
Contact person	Alberto P. Fenix Executive Director

C. Government

Company	PSALM (Power Sector Assets and Liabilities Management) Corporation
Address	3rd Floor, National Transmission Corporation (TransCo) Bldg. Power Center, Quezon Avenue cor. BIR Road Diliman, Quezon City 1101
Telephone	+63 2 902 9000
Email	infos@psalm.gov.ph
Website	https://www.psalm.gov.ph/
Brief Description	PSALM undertakes a range of activities preparatory to the bid proper, including drafting information memoranda and transaction documents to be distributed to prospective bidders. PSALM also conducts due diligence on its assets to determine their readiness for privatization.
Contact person	Lourdes Alzona Officer in Charge

Company	National Power Corporation
Address	NPC Building, Quezon Ave, Corner Bir Road, Diliman, Quezon City, 1100 Metro Manila
Telephone	+63 2 921 3541
Fax	+63 2 921 2468
Email	postmaster@napocor.gov.ph

Website	www.napocor.gov.ph
Brief Description	National Power Corporation engages in the generation and distribution of electricity. It also manages and rehabilitates watersheds, reservoirs, and dams; and operates a nuclear power plant that produces nuclear power. The company also engages in the operation and maintenance of undisposed generating assets that include hydroelectric and thermal power plants, and power barges; and management of IPP contracts.
Contact person	Pio J. Benavidez President and Chief Executive Officer Telefax No. +63 2 9212998

Company	Salcon Phils./Atlas
Address	8741 Paseo De Roxas, Makati
Telephone	02 810 4450
Fax	893 4844
Email	spc@unet.net.ph
Website	http://www.spcpowergroup.com/
Brief Description	Salcon Philippine Corporation is authorized to primarily engaged in the design, construction, rehabilitation, operation, maintenance and management of power generation, supply and distribution of plants and related facilities

D. Equipment Rentals Companies

Company	Association of Carriers and Equipment Lessors (ACEL)
Address	Suite 1601, 16th Floor, Jollibee Plaza Condominium F. Ortigas, Jr. Road, Origas Complex Pasig City, Philippines
Telephone	+63 2 6313136
Telefax	+63 2 6334994
Email	secretariat@acel.com
Website	http://www.acel.com.ph/
Brief Description	The Association of Carriers and Equipment Lessors (ACEL), Inc. was formed two decades after the 2nd World War, when the country was in direst need of construction equipment and other technical resources that would facilitate the reconstruction of the devastated nation. Several contractors and equipment lessors gathered together to devise a plan through which the unavailability of construction equipment in construction activities in sectors such as power, irrigation, transport, commercial, housing and real estate developments could be addressed.
Contact person	Onofore T. Banson, Jr. President He is also the president of Monark Equipment Corporation

ACEL would be the best first point of contact when it comes to construction equipment rentals. It has around 200 members at the moment.

Company	Global Heavy Equipment and Constructions Corporation
Address	#169 Chico St., Project 2, Brgy. Quirino 2C, Quezon City, Philippines
Telephone	+63 2 433 3228; 434 1781; 435 4928; 434 6750; 799 2150
Telefax	+63 2 433 3228 loc. 103
Mobile	+63 925 8123991
Email	inquiries@globalheavyequipment.net
Website	http://www.globalheavyequipment.net
Brief Description	GHEC Corporation is engaged in heavy equipment, rental and sales, refurbish ore repair of heavy equipment foundation works, port facilities, power plant, steel fabrication and erection, road works, civil works, and earth moving. The company has supplied crane equipment to TREVI foundation specialist in the NIA III Airport Terminal Construction.
Contact person	Amando Diaz amando@globalheavyequipment.net

Company	Liebherr
Address	Nearest to the Philippines Location: No. 8 Pandan Avenue 609384 Singapur, Singapore
Telephone	+65 6266 5223
Fax	+65 6265 2305
Mobile	+639 338 540893
Email	info.lsi@liebherr.com
Website	www.liebherr.com
Brief Description	Liebherr offers quality-products, especially mobile crane and crawlers, and various services related to construction. It also offers rental machines and vehicles for a wide range of requirements, including services such as consultation, staff training, and logistics if desired.

Company	Monark Equipment Corporation
Address	Quezon City - Head Office 13 Economia St., Bagumbayan, Quezon City, Metro Manila 1110
Telephone	+63 2 635 0901 Cat Rental Store: +63 2 635 0901 loc. 1421
Fax	+63 2 635 2644
Mobile	+63 9175929656
Email	jrbanson@monark-cat.com
Website	http://www.monark.cat.com
Brief Description	It is a one-stop shop that showcases machines and engine, Monark Equipment also leads different industries by making every job possible, fast, and productive. They are in the following industries – agriculture, construction, industrial, manufacturing, marine, mining, power and quarry.
Contact person	Onofre T. Banson, Jr. President

E. Mobile and Crawler Crane Suppliers

Company	CBBE Crane Rental & Trucking Services Inc.
Address	G. Araneta Ave, Quezon City, 1114 Metro Manila
Telephone	(02) 712 4661

Company	Guzent Inc. - Construction Equipment Sales & Rental
Address	1237 Epifanio de los Santos Ave, Balintawak, Quezon City, 1106 Metro Manila
Telephone	0918 900 9399

Company	Ravago Equipment Rentals, Inc.
Address	64 North Bay Boulevard,, Navotas, 1485
Telephone	(02) 287 5191

Company	Jamilcres Inc.
Address	102 Tandang Sora Ave, Novaliches, Quezon City, 1100 Metro Manila
Telephone	(02) 456 2599

Company	MHE-Demag (P) Inc
Address	Main Avenue, Severina Diamond Industrial Estate KM South Expressway, W Service Rd, Parañaque, 1700 Metro Manila
Telephone	(02) 786 7500

Company	Flexicore Construction Services
Address	102-D Tandang Sora Avenue, Quezon City, 1107 Metro Manila
Telephone	(02) 843 3414

Company	Atlas Copco Philippines
Address	North Main Avenue, Lot 12 Block 2, Laguna Technopark, Biñan, 4024 Laguna
Telephone	(02) 584 4757

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ANNEX: Indicative Projects in Hydro and Wind as of February 2017

Indicative Projects in Hydro as of February 2017

Tinoc 1, 2, 3, 4, 5, and 6 Hydropower Projects

Located in Tinoc, Ifugao, these hydropower plant is currently undertaking permits and with an on-going pre-construction phase. Tinoc 1, 2 and 4 have an accumulative rated power of 43 MW. Tinoc 1,2, and 4 are grantees under the company Philnew Hydropower Corporation while Tinoc 3 is under the company Quadriver Energy Corp but both companies are owned by Sta. Clara International Corporation. Sta. Clara International Corporation is an independent power producer specializing in run-of-the-river plants and is a Quadruple A licensed contractor.

Company Name:	Sta. Clara International Corporation
Address:	Highway 54 Plaza 986 EDSA Wack-Wack Mandaluyong City
Contact No.:	+63 2 706 5156 / 706 5158
Email Address:	info@staclara.com.ph; elmoanselmostaclara@gmail.com
Website:	www.staclara.com.ph
Contact person:	Elmo Anselmo, Quantity Surveyor

Quadriver Energy Corp and Philnew Hydropower Corporation have a number of indicative power projects that are under pre-construction phase. The total rated power for both companies are 105.7 MW.

Quadriver Energy Corp			Philnew Hydropower Corporation		
Project Name	Location	Rated Power	Project Name	Location	Rated Power
Tinoc 3	Tinoc, Ifugao	8	Tinoc 1	Tinoc, Ifugao	4.1
Tumauini (Lower Cascade)	Tumauini, Isabela	7.8	Tinoc 2	Tinoc, Ifugao	11
Tumauini (Upper Cascade)	Tumauini, Isabela	14	Tinoc 4	Tinoc, Ifugao	5
			Tinoc 5	Tinoc, Ifugao	6.9
			Tinoc 6	Tinoc, Ifugao	8
			Alilem	Alilem, Ilocos Sur	16.2
			Danac	Sugpon, Ilocos Sur	13.2
			Quirino	Quirino, Ilocos Sur	11.5
TOTAL		29.8 MW	TOTAL		75.9 MW

Pinacanauan Hydropower Project

Pinacanauan Project located Peñablanca, Cagayan currently has a rated power of 6 MW. The hydro plant's permits and regulations is currently on track. Feasibility study and a 5-year work plan has been submitted. For now, the pre-construction phase is on-going.

Company Name:	Sunwest Water & Electric Co., Inc.
Address:	Unit 1208 West Tower, Philippines Stock Exchange Centre, Exchange Road, Ortigas Center, 1605 Pasig City, PHILIPPINES
Contact No.:	+63 2 637 4959
Email Address:	info@suweco.ph; zaldy@sunwest.com.ph
Web Address:	www.suweco.ph
Contact person:	Elizaldy Co, Chairman

Kabayan 1, 2, 3, Cervantes-Mankayan-Bakun HEPP and Bineng 1-2b Combination HEPP Hydropower Projects

These hydro plant power projects are located in Benguet, spearheaded by Hedcor, Inc., that specializes in generating renewable energy from run-of-river hydropower systems. All of these projects have currently on-going feasibility studies and is in the process of obtaining permits. Construction contracts are not yet undertaken. Financing of these projects are provided by the parent company, Aboitiz Power. The total rated of all the indicative projects under Hedcor Inc. is 188 MW.

Company Name:	Hedcor Inc.
Address:	214 Ambuclao Road, Beckel, La Trinidad, Benguet, Philippines 2601
Contact No.:	+63 74 424 4606
Email Address:	info@suweco.ph
Web Address:	www.hedcor.com
Contact Person:	Raffy Macabiog Vice President, Project Development

Project Name	Location	Rated Power
Kabayan 1	Kabayan, Benguet	20 MW
Kabayan 2 (Natalang HEP)	Kabayan, Benguet	52 MW
Kabayan 3	Kabayan, Benguet	27 MW
Bineng 1-2b Combination HEPP	La Trinidad, Benguet	19 MW
Kitaotao 1	Bukidnon	70 MW
TOTAL		188 MW

Ilaguen 1 and 2 Hydropower Projects

Ilaguen Hydropower projects are located in San Mariano, Isabela. Both projects are undergoing permits completion. As for construction, it is currently in the initial phase of submitting requirements. The rated power for both of these hydropower projects are 33 MW.

Company Name:	Strongtower Energy Services Corporation
Address:	Strongtower Energy Services Corporation Office, 4th Floor PIECO Building, 2242 Don Chino Roces Avenue, Makati City
Contact No.:	+63 2 729 9896
Email Address:	inquiries@strongtower.ph
Web Address:	www.strongtower.ph
Contact Person:	Alberto Rodriguez President and CEO

100 MW Alimit, 240 MW Alimit and Olilicon HEPP

These hydropower projects located in Lagawe, Ifugao are under SN Aboitiz Power-Ifugao and they have completed the pre-Feasibility Study and is now preparing the business plan. The financing arrangement is in process and permits are underway. The total rated power for these three projects are 350 MW.

Company Name:	SN Aboitiz Power-Ifugao
Address:	Manila-Oslo Renewable Enterprise, Inc., 10F NAC Tower, 32nd Street, Bonifacio Global City 1634, Taguig City, Metro Manila, Philippines
Contact No.:	+63 2 729 9896
Email Address:	info@snaboitiz.com
Web Address:	www.snaboitiz.com
Contact person:	Joseph S. Yu President & Chief Executive Officer

Chico Hydroelectric Power Project

The Chico Hydroelectric power project is located in Tabuk, Kalinga. This project is relatively new with DOE permits dated only in October 2016. This is currently ongoing with their permits and feasibility study.

Company Name:	San Lorenzo Ruiz Builders and Developers Group, Inc. (SLRB)
Address:	14thFloor, OMM-Citra Bldg. San Miguel Avenue, Ortigas Center, Pasig City
Contact No.:	+63 2 571 9997 / +63 2 910 7888

SLRB also owns the Bolusao Pumped Storage Hydropower project and the Davao Hydroelectric Power project.

The Bolusao Pumped Storage Hydropower is still in the initial stage of getting permits and requirements as the project only started this October 2016. This project is located in Lawaan, Eastern Samar with the rated power capacity of 300MW.

The Davao Hydroelectric Power project is located in Davao City with a rated power of 140 MW. This project only started on October 2016.

The combined rated power under SLRB amounts to 590 MW.

Wawa Pumped Storage 2 Hydroelectric Power Project

The 500 MW Wawa Pumped Storage 2 Hydroelectric Power Project is owned by Olympia Violago Water and Power Inc., a joint venture between San Lorenzo Ruiz Builders (SLRB) and Hydreq. This project was rated at 100 MW but the proposed installed capacity will go up to 500 MW. Project cost is Php 66 billion or USD 1.5 billion.

Company Name:	Olympia Violago Water and Power Inc.(OVPI)
Address:	14thFloor, OMM-Citra Bldg. San Miguel Avenue, Ortigas Center, Pasig City
Contact No.:	+63 2 571 9997 / +63 2 910 7888
Contact Person:	Anthony Jude Violago Director ajv@violagogroup.com

Aklan Pumped-Storage Hydropower

The Aklan Pumped-Storage Hydropower project started this 25 July 2016. The development stage is currently at requesting permits. This hydropower project is rated to have 300 MW power capacity. Financial arrangements as well as the construction contracts are currently on progress.

Company Name:	SMC GLOBAL POWER HOLDINGS CORP.
Address:	155 EDSA, Wack-Wack, Mandaluyong City, Philippines
Contact No.:	+63 2 702 4601
Contact Person:	Ms. Reyna-Beth D. De Guzman Investor Relations Contact +63 2 702 4500 / +63 2 632 3000

Tagoloan

Tagoloan Project located at Bukidnon, currently has a rated power of 39MW. The company has started rehabilitating the access road in Bubunawan, which is expected to be completed within the year. The Tagoloan Hydropower project started the project in 2003 but is still in initial stage of permits and requirements.

Company Name:	First Gen Corporation
Address:	First Gen Corporation, 6/F Rockwell Business Center Tower 3, Ortigas Avenue, Pasig City 1604, Philippines
Contact No.:	+63 2 449 6400 / +63 2 449 6247
Email Address:	Info@firstgen.com.ph
Website:	www.firstgen.com.ph
Contact Person:	Ms. Valerie Y. Dy Sun Vice President and Head of Investor Relations InvestorRelations@firstgen.com.ph

First Gen Corporation have a number of renewable energy projects. Most if its hydropower projects are located in Mindanao and with a total rated power of 80.75 MW

Project Name	Location	Rated Power	Status
Tagoloan	Impasugong & Sumilao, Bukidnon	39 MW	Permits and Requirements
Cabadbaran Hydroelectric Power Project	Cabadbaran, Agusan del Norte	9.75 MW	Pre-construction
Tumalaong Hydroelectric Power Project	Baungon, Bukidnon	9 MW	Pre-construction
Bubunawan Hydroelectric Power Project	Baungon and Libona, Bukidnon	23 MW	Pre-construction
TOTAL		80.75 MW	

Indicative Projects in Wind as of February 2017

Balaoi Wind Power Project

The Baloi Wind Power project, rated at 45MW power capacity, is located in Brgy. Balaoi, Pagudpud, Ilocos Norte. The total project cost is US$139.5Million. Currently, the project is past the feasibility study and the permit requirements. They are now well on their way to 52% completion of the pre-construction stage. As for the financing the whole project, 20% is already funded and the remaining amount is pending as funders require clarity on Feed-in-Tariff installation targets before committing funding. Construction contracts and agreement are 30% done with completed design and environmental studies.

Company Name:	Northern Luzon UPC Asia Corporation
Address:	20th Floor ACCRALAW Tower, 2nd Avenue corner 30th Street, Bonifacio Global City, Taguig City, 1634 Philippines
Contact No.:	+63 2 576 7961 / +63 2 576 7968
Website:	www.ayala-energyinfra.com/ac-energy/renewable-energy/nlrec/
Contact Person:	Miguel de Jesus President

Matnog Wind Power Project

Matnog Wind Power project consist of three phases totaling to a rated 565MW power capacity. Currently, the project is in the initial phase of getting the requirements and permits as it started only last April 2016. This project is located at Matnog, Sorsogon.

The Energy Development Corporation, in addition to Matnog Wind Power project, also started a number of projects located in Luzon and Visayas with all of them just started this April 2016 and is still in initial stage.

Project Name	Location	Rated Power MW
Matnog 1 Wind Power Project	Matnog, Sorsogon	153
Matnog 2 Wind Power Project	Matnog, Sorsogon	206
Matnog 3 Wind Power Project	Matnog, Sorsogon	206

Burgos 2 Wind Power Project	Burgos, Ilocos Norte	183
Iloilo 1 Wind Power Project	Batad & San Dionisio, Iloilo	213
loilo 2 Wind Power Project	Concepcion, Iloilo	500
Negros Wind Power Project	Manapla & Cadiz, Negros Occidental	262
TOTAL		1,723

Company Name:	Energy Development Corporation
Address:	Energy Development Corporation, 38th Floor, One Corporate Centre Building, Julia Vargas corner Meralco Avenue, Ortigas Center, Pasig City 1605, Philippines
Contact No.:	+63 2 982 2140
Email Address:	investors@www.energy.com.ph
Website:	www.energy.com.ph
Contact Person:	Erudito S. Recio Assistant Vice President Investor Relations Office +63 2 982 2140

Pulupandan Wind Power Project

Pulupandan Wind Power Project is located in Negros occidental with a rated power capacity of MW. The feasibility studies, permits and other requirements as well as the financial arrangements are on-going. The project cost will amount to USD124 million. The construction progress is currently on-hold due to transmission lines issue.

Company Name:	First Maxpower International Corporation
Address:	Rm. 303 Vicar Bldg., no 31 Visayas Avenue corner Rd. 1, Quezon City, Philippines
Contact No.:	+63 2 456 1640 / +63 2 351 0403
Email Address:	investors@www.energy.com.ph
Website:	www.firstmaxpower.com
Contact Person:	Francis Paderna President

Bronzeoak Wind Power Project

Bronzeoak Wind Power Project is located in Calatrava, Salvador Benedicto and San Carlos in Negros Occidental. This project started in June 2016. It is currently in initial stage of permits and requirements yet it is rated to produce 100MW power capacity.

Company Name:	First Maxpower International Corporation
Address:	4th Floor, First Global Building, #122 Gamboa corner Salcedo Streets, Legaspi Village, Makati City, Philippines
Contact No.:	+63 2 831 1253
Email Address:	info@bronzeoakph.com
Website:	www.bronzeoakph.com

New Zealand Trade and Enterprise (NZTE) is the Government agency charged with a single purpose: growing companies internationally, bigger, better and faster, for the good of New Zealand.

We employ 600 people, have over 200 private sector partners and draw on a global network of thousands more. We have people based in 50 offices, working across 24 time zones and 40 languages to support New Zealand businesses in over 100 countries. Our global presence lets us deliver value to the businesses we support, through our unique know-how (knowledge and experience) and know-who (networks and connections).

Our know-how and know-who is expressed in our Māori name: Te Taurapa Tūhono. Te Taurapa is the stern post of a traditional Māori waka, which records valuable knowledge, and stabilises and guides the craft forward.

Tūhono represents connections to people and an ability to build relationships.

We provide customised services and support to ambitious businesses looking to go global. We help them build their capability, boost their global reach, connect to other businesses and invest in their growth. We also connect international investors with opportunities in New Zealand through a global network of investment advisors.

We call on our Government network and work closely with our NZ Inc partners and the business community, to grow our national brand and help businesses to open doors in global markets.

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