The Philippines' Current Financial Mechanisms that Support the Implementation of Utility Based Renewable Energy and Efficiency[**]

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1. Background

The energy crisis of the early 1970s made the world realize that development of nations and volatile market prices of petroleum-based products are intertwined. Leaders of both developed and developing countries realized that something has to be done to address this concern and reality. The volatility of market prices of petroleum-based fuels in the global markets and its used as a political as well as economic tool among the major oil producers made it clear to world leaders that strategic decisions have to be made to cushion the implications of erratic prices of crude products and its derivatives.

The Philippine government accepted the reality and in mid-1970s, then President Marcos reacted by putting in place a government corporation (Philippine National Oil Company) and established Petrophil Corporation (the successor of Esso Philippines). Realizing the importance of energy as a dominant commodity with a pivotal role in Philippine economy, Presidential Decree was issued creating the Energy Development Board (EDB) and PD 1206 creating the Department of Energy (DOE) thus having a cabinet-level post for energy matters. During the administration of the President Marcos, an ambitious energy plan and policy was put in place and this includes developing alternate sources of energy such as solar power, wind power, hydro, and geothermal power if only to cushion impact of high cost of imported oil particularly on the country's foreign exchange reserve. Eventually, the National Energy Plan was crafted under the auspices of the DOE and its attached agencies. The development of the Philippine Energy Plan was institutionalized and it requires a series and parallel programs/projects to address energy supply amidst threats of global energy crisis. Non-petroleum energy sources like geothermal and hydro power were developed to the fullest extent and petroleum exploration in the domestic scene became a vibrant industry.[1]

2. Legal mandates established

Over the last three decades commencing in early 1970s when the Philippine government reacted to the global energy crisis brought by the unilateral moves of oil exporting countries and the OPEC oil embargo, a number of decrees and laws were put in place. An enumeration of the relevant decrees and laws that resulted to a number of power

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[1] A personal account of the author being one of the pioneering technical staff of the Non-conventional Energy Resources Division of DOE and having been a part of DOE circa 1979 – 1990.

Table 1. Legal mandates and motivating laws and policies

1. Presidential Decree 910 (Energy Development Board) – 1976
2. Presidential Decree 1206 (DOE Charter) – 1976
3. Presidential Decree 1068 (NERDP Program) - 1977
4. Foreign Investment Act (RA 7042/RA 8719) - 1991
5. Executive Order 215 (BOT projects) – 1995
6. Executive Order 462/AEO 232 - 1997
7. DOE New Charter (RA 7638) – 1992
8. BOT Law (RA 6967/RA 7718) – 1994
9. Clean Air Act (RA 1234) – 1999
10. Ecological Solid Waste Management Act (RA 9003) - 2000
11. EPIRA Law (RA 9136) - 2001
12. Biofuels Law (RA 9367) - 2006
13. Renewable Energy Law (RA 9513) - 2008

development projects including efforts related to renewable energy development is shown in Table 1.

In the renewable energy sector, Presidential Decree 1068 was issued in 1977 mandating the wider and organized efforts in the development, promotion and commercial utilization of non-conventional energy sources. The Non-conventional Energy Resources Development Program (NERDP) of the DOE was in the forefront of the efforts to develop the potentials of renewable energy technologies triggering research and development projects dealing with solar, wind energy and biomass energy sources. A number of academic institutions as well as research organizations were involved in various R & D efforts funded under the NERDP. A variety of undertakings were pursued from research to technology promotions all aimed at developing the potentials of biomass-based resources and technologies eventually popularizing the use of biogas, gasifiers, solar water heaters, wind-powered pumps, wind power conversion systems, bioethanol, coco-diesel, and most recently biodiesel in the form of crude methyl ester (CME).

The series of efforts led to putting in place administrative and legal frameworks. Major policy decisions were made by the government leadership and landmark laws were put in place via a decree during Martial Law period as well as Executive Orders and by acts of Congress. The Foreign Investment Act (RA 7042 as amended by RA 8719) served as a come on for many local and foreign investors for the incentives it promises and the investors in the power generation sectors took advantage of it. The issuance of the Executive Order 215 that eventually resulted to the enactment of the Build-Operate-Transfer Law (RA 6957 as amended by RA 7718) resulted to a large number of private sector-financed power generation plants once a major responsibility and monopoly which later became the budgetary burden of the government. Moreover, the enactment of the Clean Air Act (RA 8749) and Ecological Solid Waste Management Act (RA 9003) also gave a push and served as the motivator for investors to consider green, renewable and clean energy technologies. Furthermore, the enactment of Electric Power Industry Reform Act (RA 9136), Biofuesl Law of 2006 (RA 9367), and most recently the Renewable Energy Act of 2008 (RA 9513) are developments

that further triggered private sector investments in power generation as well as transmission and many looked at this particular law as a great booster for inviting more local and foreign investments in renewable energy projects.

Prior to the enactment of the abovementioned laws, investments in energy projects/ventures were included in the investment priorities program of the Board of Investments thus entitling investors a number of incentives such as tariff/duty privileges as well tax holidays. Along with the political will of the government leadership as well as management initiatives of concerned government agencies, the renewable energy sector is now a vibrant sector of the economy. Several renewable energy companies are now serving the market and more conspicuously are the megawatt level business project in wind and solar photovoltaics that is now part of the electrical grid system.

3. Renewable energy resources and policies [2]

The country is endowed with natural resources which allowed it to develop its potentials and in many ways contributed a lot to the power supply of the country. In a study released by the New and Renewable Energy Laboratory (NREL) of USA, the following potentials of renewable energy was identified.[2]

a) Wind resources – over 10,000 km^2 with 76,000 MW of potential installed capacity.
b) Micro-hydro applications – potential capacity of at least 500 KW in Luzon and Mindanao islands
c) Solar radiation nationwide – an annual potential average of 5.0 – 5.1 $KWh/m^2/day$
d) Mini-hydro potential capacity of 1,784 MW capacity for 888 sites
e) Ocean energy resources – potential capacity of about 170,000 MW
f) Biomass (Bagasse) total potential of 235 MMBFOE

To enable the development of the potentials of its renewable energy resources, the Philippine Energy Plan enshrined a commitment to a renewable energy policy development as follows:

a) Renewable energy policy framework launched in 2003.
b) Policy bias towards the development and utilization of renewable energy:

i) Promote more private sector participation in RE development
ii) Encourage the use of renewable energy in rural and off- grid electrification
iii) Renewable energy projects given " priority " for special incentives

c) Having a renewable energy law to promote development and utilization of clean energy (enacted in 2008 as Republic Act 9513)

Giving substance and concrete meaning, the renewable energy development policy framework was translated into long-term objectives as follows:

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[2] Karunungan, E., Renewable Energy Fuels: Key to Energy Independence and Security, Department of Energy, Makati City, Philippines, 2008

a) Increase renewable energy-based capacity by 100 % - " 100 – 10 "
b) Be the number 1 geothermal energy producer in the world.
c) Be the number 1 wind energy producer in Southeast Asia
d) Double hydro electric capacity.
e) Be the solar cell manufacturing hub in ASEAN.
f) New contribution of biomass, solar and ocean energy by more than 100 MW
g) Increase non-power contribution of RE to energy mix by 10 MMBFOE with the next 10 years.

Giving concrete results to the long-term objectives set forth are the various completed and on-going undertakings as summarized in Table 2.

4. Market system for electric power

The monopoly of power generation by National Power Corporation under Presidential Decree was dismantled through a privatization policy. This policy statement tempered with the enactment of the Electric Power Industry Reform Act or EPIRA Law (RA 9136) resulted to a new market system for the electric energy sector. The electric power sector in particular was transformed from a monopolistic market to that of a free market system open to any interested parties limited only to ownership structure as mandated by the Philippine constitution.

The developments in the power generation sector resulted to a new market system as shown in Figure 1. As shown in Figure 1, the National Power Corporation (NPC) is still presented as a power generator or generating company (GENCO) pending its full privatization. However, private sector investments in power generation are now in place as evidenced by a growing number of independent power producers (IPPs). Also a significant

Table 2. Renewable energy development status

Resource	Existing capacity (MW)	Number of plants in operation	On-going projects
Geothermal	2,027.07	14 geothermal plants	10 projects offered to private investor (300 – 500 MW)thru Contracting Round
Hydro	3,367.07	21 large hydro, 52 mini-hydro, 61 micro hydro	4 mini-hydros, 14 large hydro under evaluation
Wind	25.2	33 KW In Ilocos Norte, 5 KW Camarines in 180 KW in Batanes, 6 KW in Boracay	NPDC wind farm, 7 sites on resource assessment
Solar	5.161	960 KW – CEPALCO, Cagayan e Oro 729 KW Camarines Sur	Sunpower Phil Solar Plant/rural electrification projects
Biomass	20.93		1 MW Isabela
Ocean			R & D activities – Demo projects in Leyte/Mindanao

Source: E. Karunungan (Department of Energy), Philippines

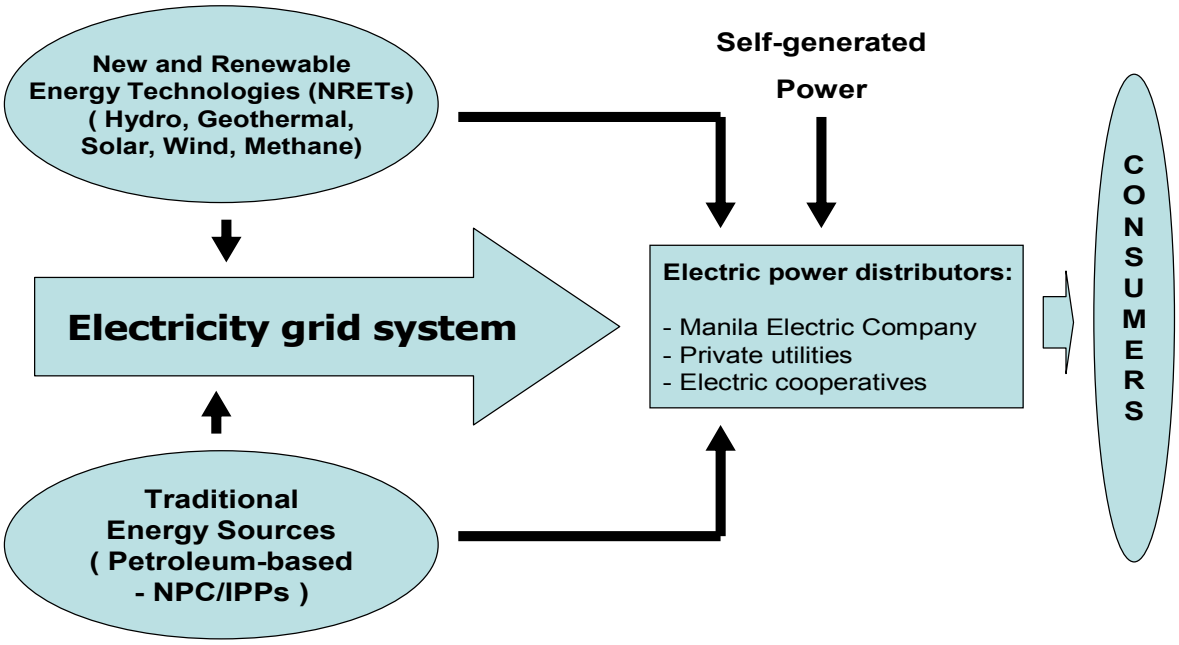


Figure 1. The electricity grid and distribution system in the Philippines

development in the new market system is that electricity distribution companies (i. e., privately-owned utilities and electric cooperatives) are now authorized to develop and produce their electric power thus allowing backward integration opportunities not only for economic but also for technical reasons as well.

Adding more incentives to both the generators and buyers of electric power is the provision in the EPIRA Law which mandates the establishment of the Wholesale Electricity Spot Market (WESM). The spot market is a platform that simulates a free market system that can work to the advantage of both the GENCOs and the distribution companies or in certain cases, to the contrary. Hopefully, the new market framework illustrated by the diagram shown in Figure 2 will result to benefits to end users in the form of affordable or cheaper tariffs for electric power.

The variety of laws and policies set forth by the government ensure and allow the free market system to work giving market competition to play well. With new and renewable energy technologies (NRET) fitted against petroleum-based power plants with more incentives favoring the former, it is hoped that new and renewable energy businesses and industry would emerge and flourish.

5. The electrical grid system

To ensure connectivity and markets for the output of commercial power generation projects large or small, the country operates an electricity grid system. This grid scheme was in place even at the time when power generation and region-wide distribution was a

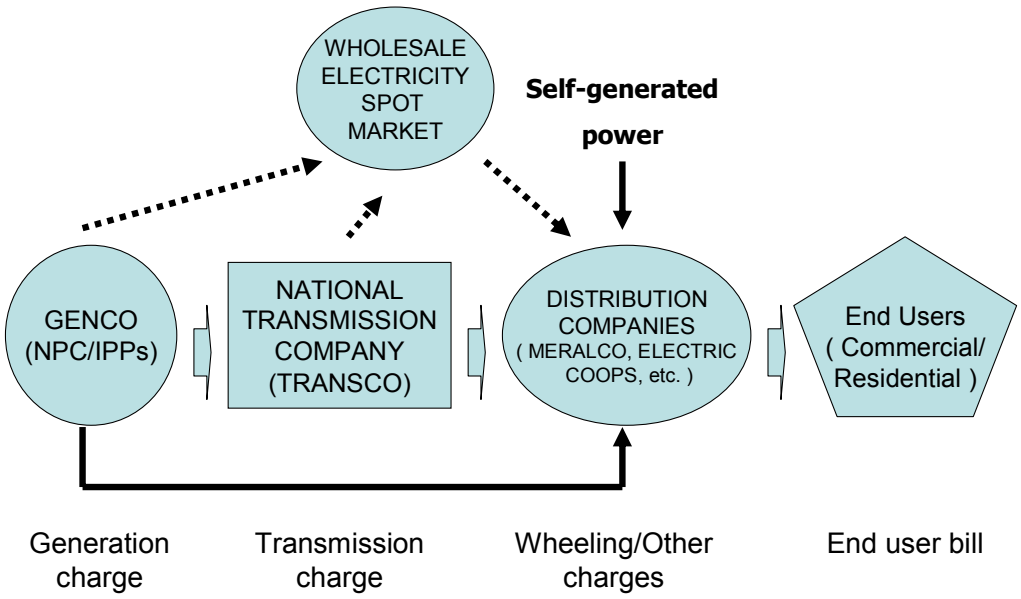


Figure 2. The power distribution system and WESM

responsibility monopoly of NPC. There is grid for the major islands of Luzon, Visayas and Mindanao where provincial level power distributors (e. g., electric cooperatives) can source their power for retail to institutional and residential consumers.

As mandated by the EPIRA Law, the idea of the grid and Grid Code was put in place. As defined in the EPIRA Law, grid refers to the high voltage backbone system of interconnected transmission lines, substations and related facilities. The EPIRA Law espouses a Grid Code referring to the set of rules and regulations governing the safe and reliable operation, maintenance, and development of the high voltage backbone transmission system and its related facilities.[3]

Also forming part of the provisions of the EPIRA Law, a National Transmission Corporation (TRANSCO) is organized to acquire all the transmission assets of the NPC. TRANSCO was specifically organized to assume the electrical transmission function of NPC, and have all the powers and functions granted unto it. TRANSCO assumes the authority and responsibility of NPC for the planning, construction and centralized operation and maintenance of high voltage transmission facilities, including grid interconnections and ancillary services.

With regional grid system now in place, sufficient infrastructural provision are also in place for any generation company (GENCO) using renewable energy sources to interconnect with the electricity grid thus assuring a ready market of its output. It is just a matter for the

[3] Electric Power Industry Reform Act of 2001 (RA 9513)

renewable energy power generator to deliver an electrical energy output consistent with the voltage levels of the power grid nearest to it or to the specific demand of its buyer/user should it opt to directly embed its output to the distribution system of the utility company.

The grid system at the regional level allows the transport of indigenous and renewable energy-based system to other parts of island in the country thus enhancing efficiency and maximizing the use of the energy output at the same time providing the electricity supply in areas with insufficient generation capacity. This is the particular case in Negros island where excess capacity from geothermal plants was transmitted to Cebu island (both in the Visayas region) using the submarine cable that connects these two islands.

Following the mandate under the EPIRA Law, there is now a Philippine Grid Code promulgated by the Energy Regulatory Commission (ERC) which it approved per Resolution No. 115.

6. Power sector situationer

The development of various energy sources to produce electricity is one of the lessons learned by developing countries in reacting to the negative impacts of the unilateral actions of the major oil producers particularly the Organization of Petroleum Exporting Countries (OPEC). The developments in the supply side of the energy sector consistent with the government policy of diversifying energy sources resulted to an energy supply mix across various parts of the country. In particular, shown on Figure 3 is the power situationer in the electric power grid of Luzon showing the capacity and generation mix.

As shown in Figure 3, the combined share of indigenous and renewable energy (geothermal, hydro) is already at 26 percent (in installed capacity) with a small percentage from wind energy which is totally zero years ago. The grid capacity and generation mix for Mindanao region is shown in Figure 4. As shown in Figure 4, the Mindanao grid is largely hydro-based power sources and it accounts for 51 percent in terms of installed capacity. Also in Mindanao, solar energy is making a dent both in capacity and generation mix where in fact years back, it is zero just like wind energy sources. In the coming years, it is hoped that both wind and solar energy will have substantial number or quantities in the country's installed capacity and generation mix.

Indicative of the increasing concerns of the private sector in directly participating in the supply side of the energy business by way of direct investments is the diagram shown in Figure 5. As shown in Figure 5, renewable energy-based power sources are expanding in capacity in the Luzon grid. Wind power project in Burgos (NorthWind Power Development Corporation) is expected to increase to 86 MW by 2011, Pagudpud wind power project is projected to be generate 20 MW and Pamplona wind power project is expected to install 40 MW.

Projected to be major renewable energy projects also to contribute to the Luzon grid are the green energy projects expected to be established. The Nueva Ecija biomass project of 20 MW in capacity is projected to be on stream by the year 2011,

In the Visayas grid, the projected contribution of biomass energy is shown in Figure 6. As shown in Figure 6, private sector initiative is active with a projected energy supply of 36

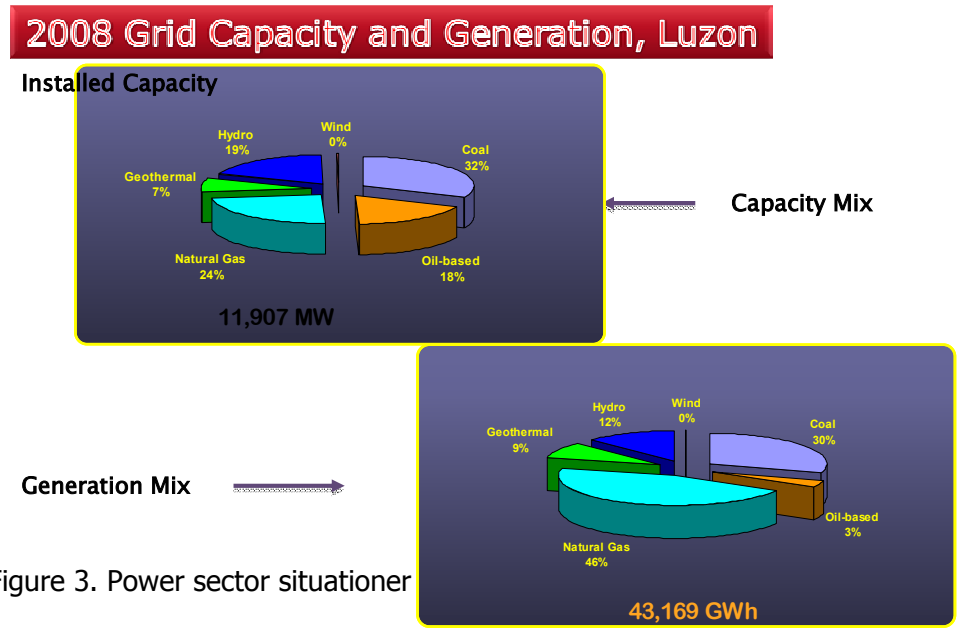


Figure 3. Power sector situationer

Source: Department of Energy

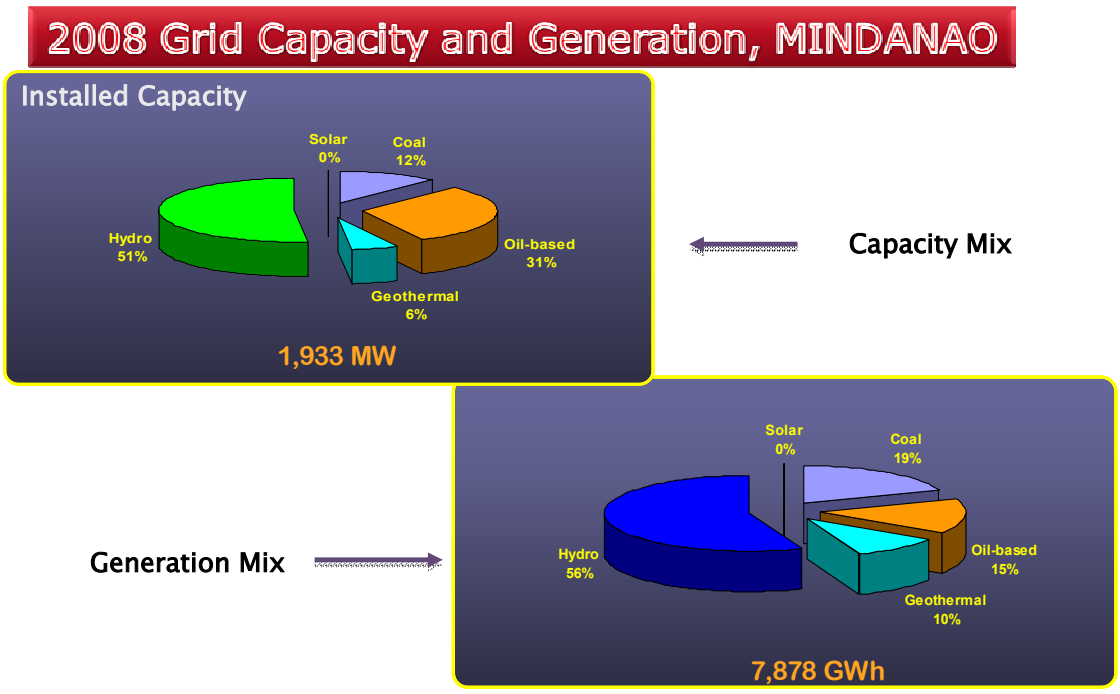


Figure 4. Power sector situationer

Source: Department of Energy

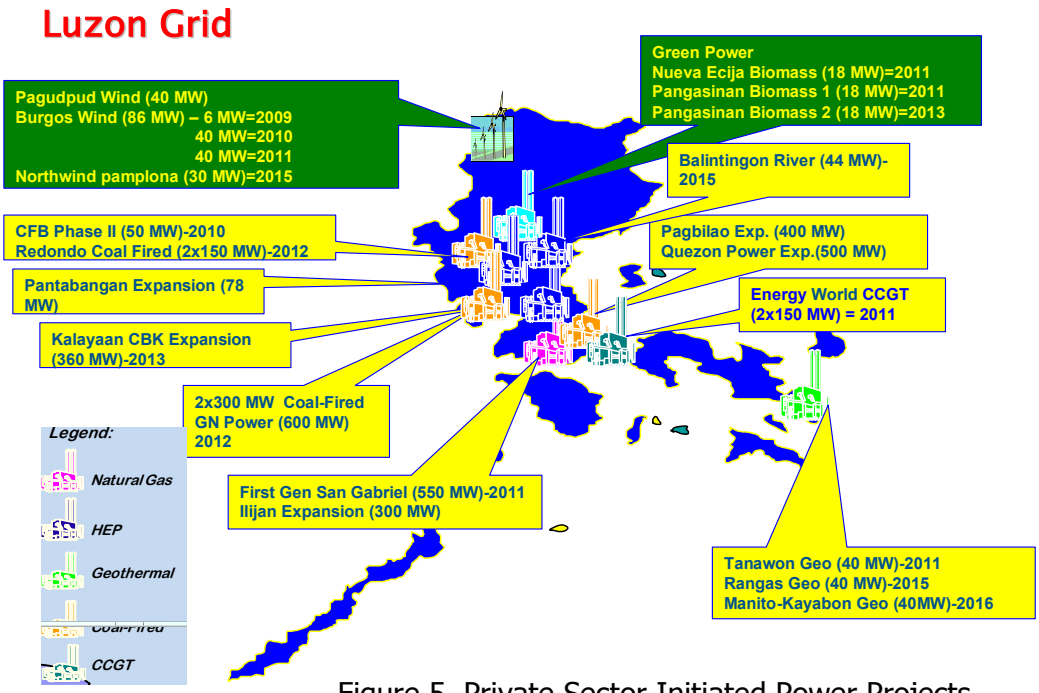


Figure 5. Private Sector Initiated Power Projects

Source: Department of Energy

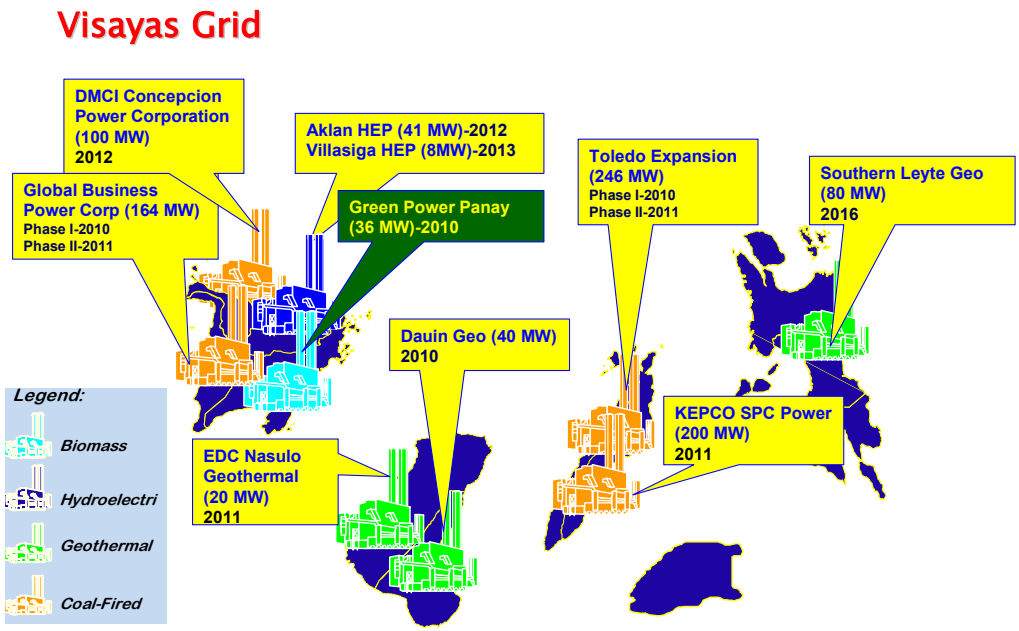


Figure 6. Private Sector Initiated Power Projects

Source: Department of Energy

For the Mindanao grid, the upcoming contribution of biomass-based energy is shown in Figure 7. A 10 MW power plant of Green Power Biomass is projected to be on stream by the year 2010.

The historical energy supply mix in the country as facilitated by the grid system is shown in Table 3. As shown in Table 3, indigenous energy production increased from a share of 15.49 percent in 1993 to 49.07 percent in 2000 and 55.8 percent by the end of year 2007. Much of the increase in contribution of indigenous energy supply is accounted for by hydro, geothermal, solar, wind, and to a certain extent, biodiesel in the form of crude methyl ester (CME).

7. The Renewable Energy Act of 2008

Giving inspiration and impetus to the development of the renewable energy sector of the Philippines are the administrative policies/directors set forth and various laws enacted as earlier mentioned as well as the political will to undertake the specific programs and projects.

After a series of programs, projects, and a variety of initiatives to develop, promote, and commercialize the use of renewable energy in the country, a landmark legislation for the renewable energy sector was put in place by Congress. This is the enactment of the Republic Act No. 9513 otherwise known as the Renewable Energy Law (REL) of 2008.

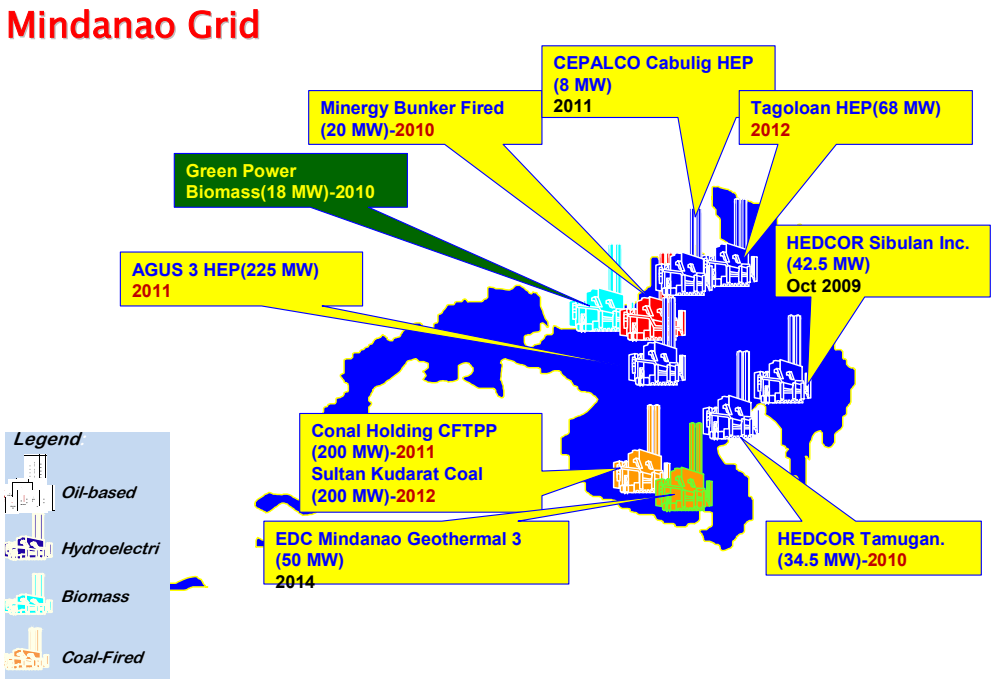


Figure 7. Private sector initiated power projects

Source: Department of Energy

Table 3. Energy supply mix of the Philippines, MTOE

	1993	% Share	1995	% Share	2000	% Share	2005	% Share	2007	% Share
INDIGENOUS ENERGY	**15.49**	**53.07**	**15.43**	**46.51**	**19.48**	**49.07**	**21.20**	**54.57**	**21.97**	**55.69**
OIL	0.45	1.53	0.13	0.39	0.06	0.14	0.61	1.57	0.63	1.59
NATURAL GAS	-	0.00	0.00	0.01	0.01	0.02	2.70	6.95	3.03	7.69
COAL	0.80	2.73	0.68	2.05	0.71	1.80	1.52	3.91	1.80	4.55
Subtotal	**16.73**	**57.33**	**16.24**	**48.96**	**20.26**	**51.03**	**26.03**	**67.01**	**27.42**	**69.52**
HYDRO	1.25	4.29	1.55	4.68	1.94	4.89	2.09	5.37	2.13	5.41
GEOTHERMAL	4.87	16.70	5.28	15.90	10.00	25.19	8.52	21.92	8.78	22.27
BIOMASS (Bagasse and Other RE)	8.12	27.82	7.79	23.48	6.76	17.02	5.77	14.84	5.56	14.10
SOLAR AND WIND				0.00			0.00	0.00	0.01	0.01
CME				0.00			0.00	0.00	0.03	0.08
Subtotal	**14.25**	**48.81**	**14.62**	**44.06**	**18.70**	**47.10**	**16.37**	**42.14**	**16.51**	**41.87**
NET IMPORTED ENERGY	**13.70**	**46.93**	**17.75**	**53.49**	**20.22**	**50.93**	**17.65**	**45.43**	**17.48**	**44.31**
OIL	13.02	44.62	16.84	50.77	16.39	41.30	13.94	35.87	13.40	33.96
COAL	0.67	2.30	0.90	2.72	3.82	9.63	3.71	9.55	4.08	10.34
ETHANOL				0.00	-	-	0.00	0.00	0.00	0.01
				0.00						
TOTAL ENERGY	**29.19**	**100.00**	**33.18**	**100.00**	**39.69**	**100.00**	**38.85**	**100.00**	**39.44**	**100.00**
GROWTH RATE (Total Energy), %			**5.49**		**2.93**		**0.10**		**1.81**	
Self Sufficiency %	**53.07**		**46.51**		**49.07**		**54.57**		**55.69**	

Source: Department of Energy

The Renewable Energy Law (REL) made a number of significant provisions to address the development, financing, and marketing electricity as well as incentives for renewable energy-based power generation systems. Under the provisions of the Renewable Energy Law, general incentives have been accorded to investors in renewable energy projects as stipulated under Chapter III of the said act. In particular, the said law provided as follows:

> **SEC.15.** ***Incentives for Renewable Energy Projects and Activities.*** **– RE developers of renewable energy facilities, including hybrid systems, in proportion to and to the extent of the RE component, for both power and non-power applications, as duly certified by the DOE, in consultation with the BOI, shall be entitled to the following incentives:**
>
> **(a) Income Tax Holiday (ITH) – For the first seven (7) years of its commercial operations, the duly registered RE developer shall be exempt from income taxes levied by the national government.**
>
> **Additional investments in the project shall be entitled to additional income tax exemption on the income attributable to the investment:** ***Provided, That*** **the discovery and development of new RE resource shall be treated as a new investment and shall therefore be entitled to a fresh package of incentives:** ***Provided, further,*** **That the entitlement period for additional investments shall not be more than three (3) times the period of the initial availment of the ITH.**
>
> **(b) Duty-free Importation of RE Machinery, Equipment and Materials – Within the first ten (10) years upon the issuance of a certification of an RE developer, the importation of machinery and equipment, and materials and parts thereof, including control and communication equipment, shall not be subject to tariff duties:** ***Provided, however,*** **That the said machinery, equipment, materials and parts are directly and actually needed and used exclusively in the RE facilities for transformation into energy and delivery of energy to the point of use and covered by shipping documents in the name of the duly registered operator to whom the shipment will be directly delivered by customs authorities:** ***Provided, further,***

That endorsement of the DOE is obtained before the importation of such machinery, equipment, materials and parts is made.

Endorsement of the DOE must be secured before any sale, transfer or disposition of the imported capital equipment, machinery or spare parts is made: *Provided,* That if such sale, transfer or disposition is made within the ten (10) -year period from the date of importation, any of the following conditions must be present:

> **(i) If made to another RE developer enjoying tax and duty exemption on imported capital equipment;**
>
> **(ii) If made to a non-RE developer, upon payment of any taxes and duties due on the net book value of the capital equipment to be sold;**
>
> **(iii) Exportation of the used capital equipment, machinery, spare parts or source documents or those required for RE development; and**
>
> **(iv) For reasons of proven technical obsolescence.**

When the aforementioned sale, transfer or disposition is made under any of the conditions provided for in the foregoing paragraphs after ten (10) years from the date of importation, the sale, transfer or disposition shall no longer be subject to the payment of taxes and duties;

(c) *Special Realty Tax Rates on Equipment and Machinery.* – Any law to the contrary notwithstanding, realty and other taxes on civil works, equipment, machinery, and other improvements of a Registered RE Developer actually and exclusively used for RE facilities shall not exceed one and a half percent (1.5%) of their original cost less accumulated normal depreciation or net book value: *Provided*, That in case of an integrated resource development and generation facility as provided under Republic Act No. 9136, the real property tax shall only be imposed on the power plant;

(d) *Net Operating Loss Carry-Over (NOLCO).* – The NOLCO of the RE Developer during the first three (3) years from the start of commercial operation which had not been previously offset as deduction from gross income shall be carried over as a deduction from gross income for the next seven (7) consecutive taxable years immediately following the year of such loss: *Provided, however,* That operating loss resulting from the availment of incentives provided for in this Act shall not be entitled to NOLCO;

(e) *Corporate Tax Rate* – After seven (7) years of income tax holiday, all RE Developers shall pay a corporate tax of ten percent (10%) on its net taxable income as defined in the National Internal Revenue Act of 1997, as amended by Republic Act No. 9337. *Provided,* That the RE Developer shall pass on the savings to the end-users in the form of lower power rates.

(f) *Accelerated Depreciation.* - If, and only if, an RE project fails to receive an ITH before full operation, it may apply for Accelerated Depreciation in its tax books and be taxed based on such: *Provided*, That if it applies for Accelerated Depreciation, the project or its expansions shall no longer be eligible for an ITH. Accelerated depreciation of plant, machinery, and equipment that are reasonably needed and actually used for the exploration, development and utilization of RE resources may be depreciated using a rate not exceeding twice the rate which would have been used had the annual allowance been computed in accordance with the rules and regulations prescribed by the Secretary of the Department of Finance and the provisions of the National Internal Revenue Code (NIRC) of 1997, as amended. Any of the following methods of accelerated depreciation may be adopted:

i) **Declining balance method; and**
ii) **Sum-of-the years digit method**

(g) *Zero Percent Value-Added Tax Rate* – The sale of fuel or power generated from renewable sources of energy such as, but not limited to, biomass, solar, wind, hydropower, geothermal, ocean energy and other emerging energy sources using technologies such as fuel cells and hydrogen fuels, shall be subject to zero percent (0%) value-added tax (VAT), pursuant to the National Internal Revenue Code (NIRC) of 1997, as amended by Republic Act No. 9337.

All RE Developers shall be entitled 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.
This provision shall also apply to the whole process of exploring and developing renewable energy sources up to its conversion into power, including but not limited to the services performed by subcontractors and/or contractors.

(h) ***Cash Incentive of Renewable Energy Developers for Missionary Electrification*** **-- A renewable energy developer, established after the effectivity of this Act, shall be entitled to a cash generation-based incentive per kilowatt hour rate generated, equivalent to fifty percent (50%) of the universal charge for power needed to service missionary areas where it operates the same, to be chargeable against the universal charge for missionary electrification;**

(i) ***Tax Exemption of Carbon Credits*****—All proceeds from the sale of carbon emission credits shall be exempt from any and all taxes;**

(j) ***Tax Credit on Domestic Capital Equipment and Services.*** **– A tax credit equivalent to one hundred percent (100%) of the value of the value-added tax and custom duties that would have been paid on the RE machinery, equipment, materials and parts had these items been imported shall be given to an RE operating contract holder who purchases machinery, equipment, materials, and parts from a domestic manufacturer for purposes set forth in this Act:** ***Provided,*** **That prior approval by the DOE was obtained by the local manufacturer:** ***Provided, further,*** **That the acquisition of such machinery, equipment, materials, and parts shall be made within the validity of the RE operating contract.**

In addition to the aforementioned incentives under Section 15 of the law, Section 21 provided incentives for commercialization of renewable energy technologies to cover all manufacturers, fabricators and suppliers of locally-produced RE equipment and components duly recognized and accredited by the DOE (in consultation with DOST, DOF and DTI), shall, upon registration with the BOI. This particular provision identified the Renewable Energy Sector as a priority investment sector that will regularly form part of the country's Investment Priority Plan. As such, all entities duly accredited by the DOE under the REL are entitled to all the incentives such as the following:

(a) Tax and Duty-free Importation of Components, Parts and Materials. **– All shipments necessary for the manufacture and/or fabrication of RE equipment and components shall be exempted from importation tariff and duties and value added tax:** ***Provided, however,*** **That the said components, parts and materials are: (i) not manufactured domestically in reasonable quantity and quality at competitive prices; (ii) directly and actually needed and shall be used exclusively in the manufacture/fabrication of RE equipment; and (iii) covered by shipping documents in the name of the duly registered manufacturer/fabricator to whom the shipment will be directly delivered by customs authorities:** ***Provided, further,*** **That prior approval of the DOE was obtained before the importation of such components, parts and materials;**

(b) Tax Credit on Domestic Capital Components, Parts and Materials. **– A tax credit equivalent to one hundred percent (100%) of the amount of the value-added tax and custom duties that would have been paid on the components, parts and materials had these items been imported shall be given to an RE equipment manufacturer, fabricator, and supplier duly recognized and accredited by the DOE who purchases RE components, parts and materials from a domestic manufacturer:** ***Provided,*** **That such components, and parts are directly needed and shall be used exclusively by the RE manufacturer, fabricator and supplier for the manufacture, fabrication and sale of the RE equipment:** ***Provided, further,*** **That prior approval by the DOE was obtained by the local manufacturer;**

***(c) Income Tax Holiday and Exemption.* – For seven (7) years starting from the date of recognition/accreditation, an RE manufacturer, fabricator and supplier of RE equipment shall be fully exempt from income taxes levied by the National Government on net income derived only from the sale of RE equipment, machinery, parts and services; and**

***(d) Zero-rated value added tax transactions* – All manufacturers, fabricators and suppliers of locally produced renewable energy equipment shall be subject to zero-rated value added tax on its transactions with local suppliers of goods, properties and services.**

8. Feed-in tariff system for renewable energy sources

Assurance of market outlet for renewable power generation project is vital to the development of renewable energy sector. To have this scenario and to encourage proliferation of energy from renewable energy sources particularly those intended for connection with the regional electricity or utility grid, Section 7 of the REL made specific provisions and quoted herein as follows:

SEC. 7. *Feed-In Tariff System*. -- To accelerate the development of emerging renewable energy resources , a feed-in tariff system for electricity produced from wind, solar, ocean, run-of-river hydropower and biomass is hereby mandated. Towards this end, the ERC in consultation with the National Renewable Energy Board (NREB) created under Section 27 of this Act shall formulate and promulgate feed-in tariff system rules within one year upon the effectivity of this Act which shall include, but not limited to the following:

(a) Priority connections to the grid for electricity generated from emerging renewable energy resources such as wind, solar, ocean, run-of-river hydropower and biomass power plants within the territory of the Philippines;

(b) The priority purchase and transmission of, and payment for, such electricity by the grid system operators;

(c) Determine the fixed tariff to be paid to electricity produced from each type of emerging renewable energy and the mandated number of years for the application of these rates, which shall not be less than 12 years;

(d) The feed-in tariff to be set shall be applied to the emerging renewable energy to be used in compliance with the renewable portfolio standard as provided for in this Act and in accordance with the RPS rules that will be established by the DOE.

The Renewable Energy Market (REM) is likewise established to facilitate compliance with the provisions of the law. The Department of Energy is tasked to establish the REM and shall direct Philippine Electric Market Corporation (PEMC) to implement changes to the WESM Rules in order to incorporate the rules specific to the operation of the REM under the WESM.

9. Net-metering mechanism

To have a sure or captive market for electrical energy output of renewable energy project particularly in situations where there is an excess power at the level of institutional consumers who ventured into self-generation, there has to be a mechanism to address the possibility of selling out extra output to the electrical grid system. This predicament has been addressed by the provisions of the REL on net metering and this in fact is one of the unique provisions of the law.

The net-metering scheme provided for under Section 10 reads as follows:

> **SEC. 10.** ***Net-metering for Renewable Energy.*** **– Subject to technical considerations and without discrimination and upon request by distribution end-users, the distribution utilities shall enter into net-metering agreements with qualified end-users who will be installing RE system.**
>
> **The ERC, in consultation with the NREB and the electric power industry participants, shall establish net metering interconnection standards and pricing methodology and other commercial arrangements necessary to ensure success of the net-metering for renewable energy program within one (1) year upon the effectivity of this Act.**
>
> **The distribution utility shall be entitled to any Renewable Energy Certificate resulting from net-metering arrangement with the qualified end-user who is using an RE resource to provide energy and the distribution utility shall be able to use this RE certificate in compliance with its obligations under RPS.**
>
> **The DOE, ERC, TRANSCO or its successors-in-interest, DUs, PEMC and all relevant parties are hereby mandated to provide the mechanisms for the physical connection and commercial arrangements necessary to ensure the success of the Net-metering for Renewable Energy program, consistent with the Grid and Distribution Codes.**

The net metering mechanism stands to benefit electricity distributors and institutional consumers with potentials for generating their own electricity whose excess power capacity can be sold back to the gird system. The importance of the net metering scheme lies in the fact that renewable energy plant capacity can be maximized when done by users and distributors so that there is a sure market for surplus energy production.

10. Role of government agencies

Under the stated deregulation policy in the energy sector, private investors are given much leeway and privilege in doing their business particularly with prices of petroleum-based products which is left to market conditions. Such is not the case however, with the electric power sector where certain controls and regulations are put in place but giving the investors in the power generation and distribution business the opportunity to recoup their investments plus reasonable returns at the same time addressing the concerns of end users of electric power. This concern is done by way of a series of public or consultative hearings whenever there are tariff rate changes.

The Electric Power Industry Reform Act of 2001 (RA 9136) has given government agencies like the Department of Energy (DOE) and Energy Regulatory Commission (ERC) certain specific mandate. These agencies have substantial authority to protect the various stakeholders like the investors in the electric power sector including the interests and concerns of the public at large. Generators of power from whatever sources including renewable energy resources and systems/technologies has to apply for and be cleared and/or endorsed by the Department of Energy. Final authority (i. e., Certificate of Compliance) to market the output of generation companies (GENCOs) as well as distribute the same at certain prices or tariff is left to the judgment of the ERC guided by the provisions of the EPIRA Law and its implementing rules and regulations. Deregulated as it is, the electric power industry is fully monitored by DOE and ERC as diagrammatically shown in Figure 8.

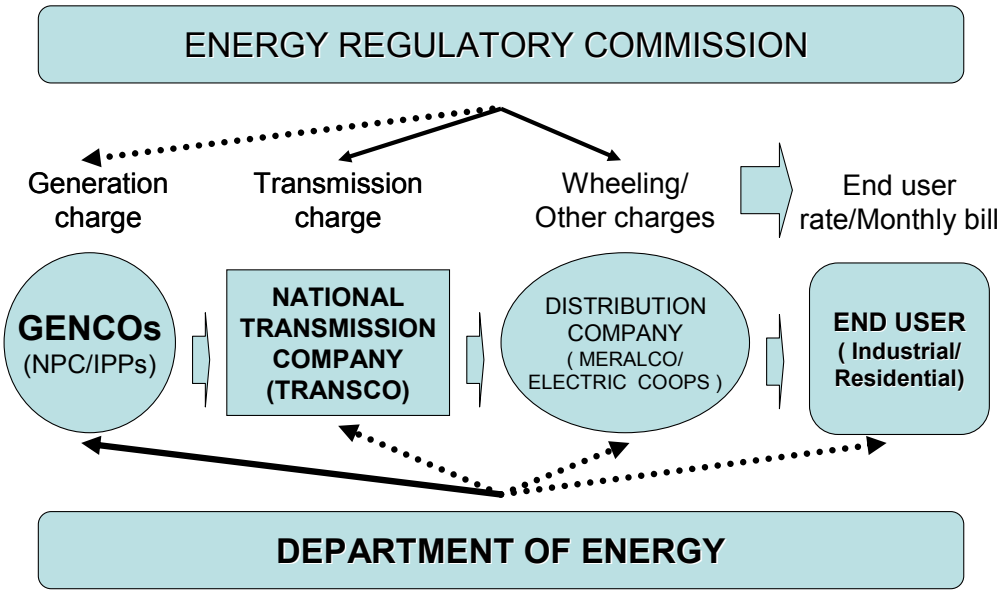


Figure 8. The electric power industry of the Philippines

10.1 The role of ERC in the EPIRA regime

Among others, the privatization policy of the government gave the private sector privilege and rights to invest in the power generation sector under the Build-Operate-Transfer (BOT) Law particularly in the early 1990s when the country experienced an acute power outages. This scenario gives the distributors and users of electric power an option from whom to buy or source their electricity which they will eventually distribute in their respective franchise or service areas. This scenario has also given some power distributors to go into horizontal and backward integration options thus making the price of electric power and object of competition hopefully to the benefit of the end users.

Added to this scenario is the creation of Wholesale Electricity Spot Market (WESM) which further give the institutional buyers (i. e., utility companies/electric cooperatives) the option where the buy or source their power at any given time of day which they believed is advantageous. This scenario is diagrammatically explained by Figure 9.

Given the liberalized scenario in power generation and the options available to distributors of electricity at end user level, ERC plays a critical role given its mandate to address the interest of the consumer - the pubic at large – without jeopardizing the return on investment and profit motives of the generation companies and the investors in general.

Under the EPIRA Law, prices charged by a generation companies is not categorically stated as subject to regulation by ERC, however, generation companies are required to submit their financial statements (to ERC) to address market power abuse or anti-competitive behavior. Unlike generation companies, transmission of electric power is a regulated common

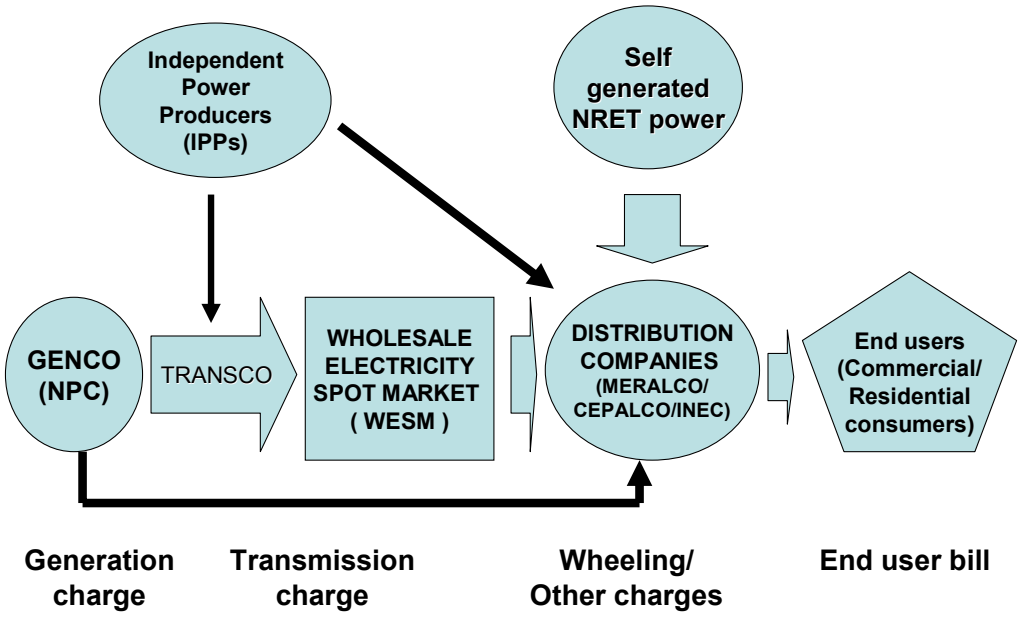


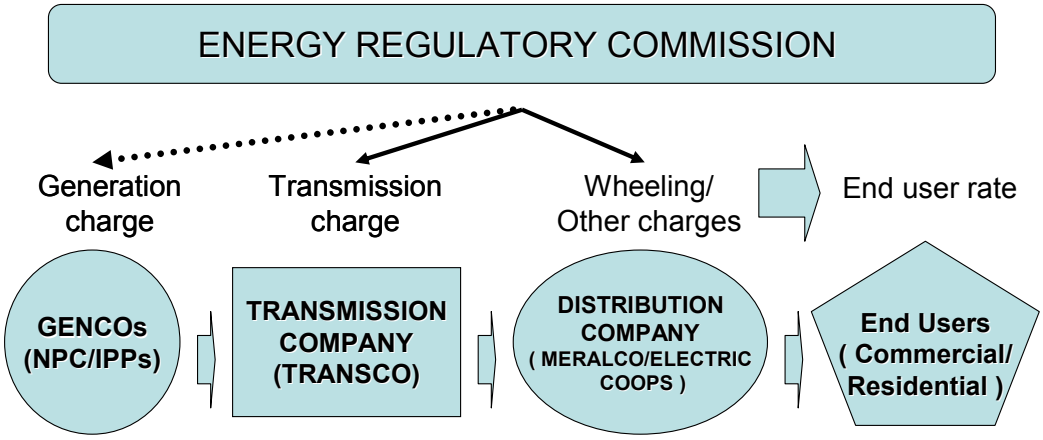
Figure 9. Power sourcing options for electric power distributors

electricity carriers and subject to ratemaking powers of the ERC. The distribution of electricity (by private utilities and electric cooperatives) to end users/consumers is subject to regulation by ERC hence tariff rates and other charges has to be approved by ERC. Diagrammatically, the role critical role played by ERC and the electricity rate or tariff making process is shown in Figure 10.

10.2 Role of WESM in electricity trade

The EPIRA Law established the Wholesale Electricity Spot Market (WESM) giving further options to concerned parties get the most out of the benefits of a free market enterprise. As referred to under the EPIRA Law, DOE is mandated to established a wholesale electricity spot market composed of the wholesale electricity spot market participants.

As provided for under the EPIRA Law, the DOE facilitated the creation of the Philippine Electricity Market Corporation (PEMC). The PEMC undertook the preparatory work and initial operation of the WESM. PEMC was established to maintain, operate and govern an efficient, competitive, transparent and reliable market for the wholesale and purchase of electricity and ancillary services in the Philippines in accordance with applicable laws, rules and regulations. The Articles of Incorporation and By-laws of the PEMC were finalized in collaboration with the WESM Technical Working Group. PEMC is a duly incorporated non-stock non-profit corporation registered with the Securities and Exchange Commission (SEC) on 18 November 2003.



Scenario 1: GENCOs submits generation rates charges to ERC
Scenario 2: TRANSCO petitions ERC for transmission charges to distributors/utilities.
Scenario 3: Distributors/Utilities petitions ERC for tariff rates to consumers/end users.
Scenario 4: Other stakeholders petitions ERC regarding tariff matters.
Note: In all scenarios, ERC involves all stakeholders in tariff setting process.

Figure 10. Electricity tariff setting process in the Philippines

Simply put, the WESM mechanism runs similar to a stock market wherein instead of trading shares of stocks, electric commodity is placed on the trading floor for any interested parties to grab. WESM shall provide the mechanism for identifying and setting the price of actual variations from the quantities transacted under contracts between sellers and purchasers of electricity.

10.2.1 Membership in WESM

To be a player in the wholesale spot market, both generation companies (GENCOs) and distributors (private utilities and electric cooperatives) have to be accredited with PEMC who runs/manages the wholesale electricity spot market.

To date, the parties directly and indirectly involved in WESM operations is shown in Table 4. As shown in Table 4, 30 generators have been accredited with WESM to sell their electricity. Seven (7) electric power distributors/retailers comprising of Manila Electric and Light Company (MERALCO) have been accredited to source their power using the WESM market system. Four (4) generators and 1 supplier have expressed their intension to be accredited with WESM. Nine (9) organizations have filed their applications with WESM.[4]

[4] www.wesm.ph

Table 4. List of accredited WESM participants

1. Generators	30
2. Distribution utilities	1
3. Electric cooperatives	6
4. Suppliers	5
5. Indirect participants	16
6. Intending WESM participants	5
7. Applicants	9

Source: www.wesm.ph (13 March 2009)

10.2.2 How does WESM work?

WESM is a system of electronically connected market players who sell and buy their need for electricity at any time of day. WESM does this by scheduling electricity generation and dispatch while balancing with demand at all times. A typical trade is as follows:

> ***Step One:*** **Trading participants submit hourly bids stating their price of, and demand for, electricity. Bids are submitted to the Market Operator (MO). Price bids reflect only the energy costs.**
>
> ***Step Two:*** **The MO matches bids using the Market Dispatch Optimization Model (MDOM), which takes into account market requirements and physical system constraints. As such, the MO first dispatches generators with the lowest offers until demand is fully met at the market clearing price.**
>
> ***Step Three:*** **The MO submits the dispatch schedule to the System Operator (SO) for implementation.**
>
> ***Step Four:*** **Suppliers and buyers settle respective payments through the WESM. Under its price determination methodology, the total cost of electricity is computed using the market clearing price (spot price), market fees, and charges for ancillary services. In the case of bilateral power supply contracts however, the involved trading participants have the option of settling directly with their contracting parties.**

This system allows for transparency wherein electricity is provided at its true cost, based on the economic principles of supply and demand.

11. Cagayan Electric Power and Light Company, Inc.

Cagayan Electric Power and Light Company (CEPALCO) is based in Cagayan de Oro City in Northeastern Mindanao. The company is one of those enterprising and socially conscious organizations who took advantage of the benefits of a deregulated electric power sector and by generating electricity using renewable energy technologies like hydro as well as solar energy sources.

The company began its operations in 1952 with a modest power later generating capacity of 5000 KW and a customer base of only 750. The company was granted congressional franchise back in June 17, 1961. Today, CEPALCO has over a hundred thousand residential, commercial and industrial customers within its franchise area that covers the City of Cagayan de Oro and the Municipalities of Tagoloan, Villanueva and Jasaan, all in the Province of Misamis Oriental, including the 3,000-hectare PHIVIDEC Industrial Estate.[5]

CEPALCO is now the 3rd largest electric distribution company in the Philippines outside of Manila Electric and Light Company (MERALCO), the biggest distributor. The company's growth in energy consumption has consistently been among the highest in the country. Modern facilities and equipment as well as efficient service network have made CEPALCO one of the most reliable electric service companies in the country. The company's distribution network includes 138KV, 69KV, 34.5KV and 13.8KV systems.

The company is a closely held company, where the Abaya family is the founding and the major shareholder. The combined four top shareholders (Fullmax Philippine Development, LLC, Abaya Investments Corporation, Breavel, Inc., and the Abaya family) together own 63.1% of the company.

11.1 CEPALCO's renewable energy development initiatives

CEPALCO has been very active in developing alternative and indigenous resources for power generation to meet its increasing demand requirements and to augment the increasingly non-dependable central generation facilities of its major power supplier. Among these indigenous resources are renewable resources, which include hydro resources, solar photovoltaic and biomass-fired generation facilities. The 7MW Bubunawan River hydro plant in the municipalities of Libona and Baungon, Bukidnon is the first hydro commissioned by CEPALCO in 2001 through its subsidiary company, the Bubunawan Power Co., Inc. (BPC) while the 1MWp solar photovoltaic plant located in Indahag, Cagayan de Oro City is the developing world's largest when it was commissioned by CEPALCO in 2004.

In the area of hydropower development as well as biomass-based technologies, following are projects and initiatives undertaken by CEPALCO:

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[5] www.cepalco.com.ph

11.1.1 Cabulig river hydro project

The Cabulig River is located in Claveria, Misamis Oriental, around 45 minutes east of Cagayan de Oro City. The feasibility study was completed in October 2006 with financial assistance from the EC – ASEAN Energy Facility. The plant technical design was completed by IT Power of UK while the environmental studies and evaluation were performed by Centric International of Austria; the financial analysis was performed by EEEC of Thailand. The Cabulig River hydro project is expected to supply CEPALCO with not less than 40 million kWh annually starting 2011. The proposed 8MW plant features 2 x 4MW Francis turbines, an open canal water conveyance system of around 3 km and a head of around 55 meters.

11.1.2 Culaman River Hydro Project

The proposed Culaman River Hydroelectric power project is located in the municipalities of Sumilao and Manolo Fortich in Bukidnon, approximately 50 km southeast of Cagayan de Oro. CEPALCO's reconnaissance activities in the Culaman River during the early part of 1990s resulted to a feasibility study indicating a hydroelectric power potential of up to 10 MW at full supply water level of 425 meter ASL and tailwater level of 200 meter ASL and discharge of 5.6 cms. Other estimates indicate that mean annual flow can go as high as 10.8 cms. The proposed hydro plant features two horizontal Francis type turbine and two synchronous generators to maximize electricity production even during low flow.

The feasibility study of the plant which was conducted in 1998 is currently being updated. The Culaman River hydroelectric power plant is expected to help satisfy the growing electricity requirements of CEPALCO beyond 2010.

11.1.3 Lower Bubunawan Hydro Project

The proposed Lower Bubunawan hydroelectric power project is located in the municipality of Baungon, Bukidnon and around 1.5 km downstream of the existing 7MW Bubunawan Power Plant. The proposed hydroelectric power project still needs a full blown feasibility study (including geotechnical and environmental studies) but pre-investment investigations indicate a potential of up to 20MW

11.1.4 Biomass-fired energy facilities

The area around the service territory of CEPALCO is pre-dominantly agricultural and a number of agro-industrial facilities exist within the 100 km radius from Cagayan de Oro. Further, Cagayan de Oro is a fast growing, highly urbanized area where the volume of the municipal solid waste is growing tremendously each year. Recognizing that these agricultural as well as municipal solid wastes are potential sources of energy, CEPALCO embarked into waste-to-energy studies, some of which are discussed below.

11.1.5 Cagayan de Oro Landfill Gas-to-Energy (LFGE) Conversion Project

Together with its foreign partners (based in Czech Republic and in Thailand), a reconnaissance study was conducted by CEPALCO in late 2005 at Cagayan de Oro's landfill site at Calaanan, which has been the dump site of Cagayan de Oro's garbage for more than 25 years. A pre-feasibility study, made part of the EAEF-funded "Increasing Access to Local Sources of Financing for Renewable Energy Investment and Design of Innovative Financing Instruments", was completed in early 2007.

On a base case scenario, the proposed LFGE project is estimated to produce around 89,000 kWH of electricity per day during its 15-year lifetime at a power plant capacity of around 4.1 MW. This volume of electricity will replace fossil fuels and reduce carbon emissions while at the same time capture the environmentally hazardous methane that naturally comes out of the landfill.

11.1.6 Cogeneration (Combined Heat and Power) projects

Combined Heat and Power requirements of some agro-industrial plants increase the value of the energy generated by a waste-to-energy cogeneration facility (a cogeneration facility produces heat as well as electrical energy). In 2006 CEPALCO conducted studies for a cogeneration facility that will satisfy the heat or steam requirements of a local manufacturing facility for its food processing while at the same time provide the electricity requirements of its equipment. The cogeneration facility shall use a mixture of biomass feedstock, which includes the manufacturing facility's own waste products, wood wastes and rice hulls.

The proposed 4.2 MW cogeneration plant is estimated to produce not less than 24 million kWh of electricity per year and a steam generation of around 260,000 tons per year. The proposed plant will also displace the bunker diesel used by the food processing plant for its conventional boilers.

CEPALCO also considered a biomass-fired facility running on full-condensing mode (electricity generation only) and using feedstock available within Misamis Oriental and from the nearby provinces (e. g., bagasse, wood waste and rice hull). Estimated volume of these agricultural wastes can supply the fuel requirement of plant with a capacity of not less than 10MW and an annual electricity generation of not less than 68 million kWh.

A bagasse-fired cogeneration facility of Crystal Sugar in Maramag, Bukidnon is presently generating an excess power of not less than 5MW, especially during off-milling season. In line with CEPALCO's renewable energy initiatives and its thrust of utilizing indigenous resources to supply its growing electricity requirements, CEPALCO is considering the addition of the 5 MW bagasse-fired power capacity into its power supply portfolio.

11.1.7 The solar photovoltaic (PV) plant

CEPALCO made a major and innovative decision by venturing into investments in renewable energy technology particularly on the photovoltaic (PV) facility. The site of the PV plant is a 2-hectare property and construction of the photovoltaic power plant was handled

by Sumitomo Corporation and it started in August 2003. The PV plant was finished in April of the succeeding year. It is this particular project of CEPALCO that shoots up the publicity of company not only in the Philippines but globally as it puts the country among the major generator of solar power from among developing countries.

The plant's 1 MW capacity consists of 6,480 Sharp ND-Q7E6Z photovoltaic modules/panels and was designed to provide up to 1,500 MWh of electricity annually. The solar PV modules are manufactured by Sharp Japan with inverters manufactured by Sansha with all the other components locally made.

The PV plant of CEPALCO started its commercial operations in September 26, 2004. After a period of 3 years of commercial operations, International Finance Corporation (IFC) of the World Bank reported that the PV plant has operated with greater expected annual energy production. Since its commercial operations, the plant has exported to CEPALCO a total of 4,169,100 KWh. At its current generating capacity, the PV plant supplies the equivalent requirement of not less than 900 CEPALCO residential customers.

The CEPALCO photovoltaic power plant generates 1.1 MW of power and is currently the 133rd largest solar power plant in the world. The PV plant puts the Philippines at number 9 among the countries in the world having the largest solar power plants! The Philippines is behind solar powerhouse Germany (who has 64 out of the top 100 largest solar power plants), Portugal, Spain, Japan, USA, Italy, the Netherlands, and South Korea.

11.1.7.1 Project cost of the photovoltaic plant

The total project cost of the photovoltaic plant of CEPALCO is about US$ 7-8 million in funding from Global Environment Facility (GEF) through the International Finance Corporation of the World Bank in the about of US $ 4 million (inclusive of grant component). The GEF support is a loan that turns into a grant after five years of successful operations of the plant by CEPALCO. Co-financing component of the project from CEPALCO is about US $ 3 – 4 million.

According to International Finance Corporation (IFC), the purpose of the project was to demonstrate solar PV's effectiveness (through a conjunctive-use application) in addressing distribution capacity issues. The IFC funds were used to build 1 MW distributed generation solar PV plant, which is integrated into the 80 MW distribution network of CEPALCO, and operated in conjunction with an existing 7 MW mini-hydro electric plant. The plant was operated without incident since its inauguration in 2004. It appears to have been successful in proving solar PV to be an effective and technically reliable technology to address peak-load energy supply issues. IFC reported that the CEPALCO solar PV plant has made a strong technical case for reliability or a utility scale solar PV power plants and the project has resulted in a significant reduction in greenhouse gas emissions.[6]

The PV project is categorized by World Bank's International Financing Corporation (WB/IFC) as a Category B project according to the Procedure for Environmental and Social

[6] World Bank/International Finance Corporation (IFC) – Project No. 502486

Review of Projects because a limited number of specific environmental and social impacts may result which can be avoided or mitigated by adhering to generally recognized performance standards, guidelines or design criteria. The project was funded in the context of technical, environmental and social information submitted by the company.

11.1.7.2 Generation cost of the PV plant

The photovoltaic power plant is a project of CEPALCO as part of its investment. As such, and having no separate organization as well as personnel for the PV plant itself, the generation cost of PV facility on a per watt or kilowatt basis is somehow unique to compute or estimate and matters deemed to be private at this time. Given the fact that as a private business organization, financial data are deemed confidential. As commercial organization, however, it is presumed that the operation of the PV facility is deemed to be a profitable business proposition given the fact that similar project is to be replicated on a larger scale.

11.1.7.3 Non-energy benefits from the PV plant

The electrical energy output of CEPALCO's PV plant may be considered small compared with other sources like large-scale hydropower plant and petroleum-based power plants. However, the contribution of the PV plant to the climate change initiatives is somehow substantial. The solar PV plant of CEPALCO is expected to displace 24,000 tonnes of CO_2 over its lifetime.

Being one of a kind, CEPALCO's PV Plant has already been visited by over 13,000 students and visitors both local as well as foreign renewable energy enthusiasts since it started operations.

The facility was even visited by the judges of the Court of Appeals in the hope that the agency can consider the project one of it models or inputs in the construction of its upcoming building.

11.1.8 Energy supply mix of CEPALCO

CEPALCO is doing every possible effort to improve the company's independence from its major electricity supplier (NPC) and this is explained by the fact that the company has now four sources of power (refer to Figure 11), three of which are from their own power plants. The entrepreneurial decision of the management of CEPALCO management to venture into PV project resulted to a variety of energy sources and flexibility. The energy supply mix of CEPALCO is diagrammatically shown on Figure 11. As shown in Figure 11, CEPALCO sources its power externally (from NPC/TRANSCO Mindanao Grid) and also internally, from its own electric generating facility, mini-hydro plant and the 1 MW photovoltaic facility.

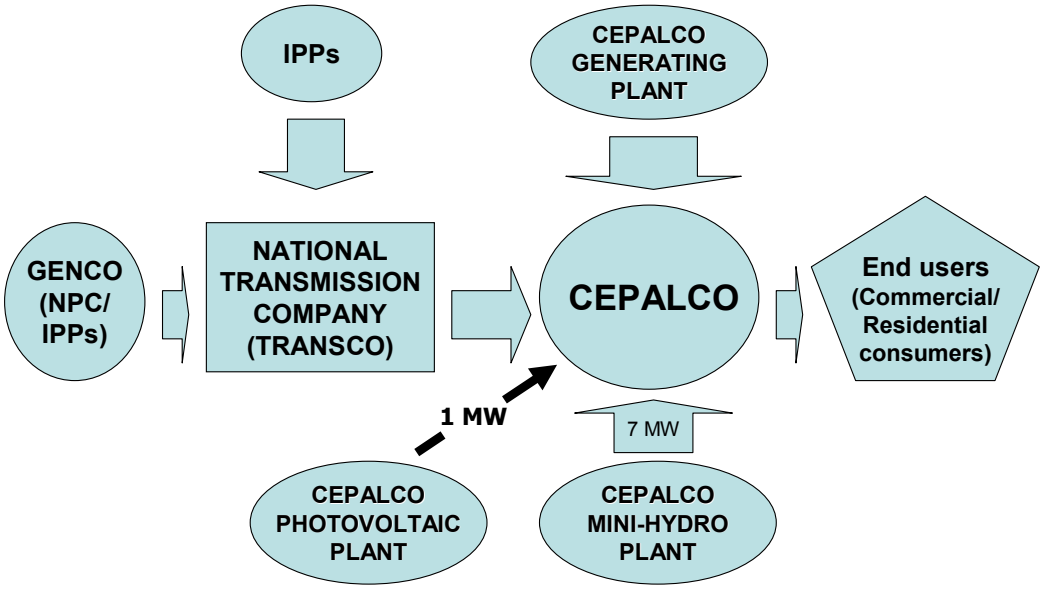

Figure 11. The CEPALCO energy supply sources

11.1.9 Expansion of the PV plant

Given the positive and encouraging experience from the existing PV facility, CEPALCO now plans to embark unto an even larger solar park within its service territory. The envisioned solar park shall make use of a 30-hectare lot within the First Cagayan de Oro Business Park in Villanueva Oriental, some 30 minutes east of Cagayan de Oro City, its base of operation.

Pre-feasibility study of the proposed PV plant expansion indicates that it will be able to supply the CEPALCO distribution network with no less than 14,000,000 KWH of electricity annually, which is equivalent to not less than 30,000 barrels of fuel oil per year. The proposed PV plant, with a total installed capacity of at least 10MWp, shall be constructed over a period of at least five years and shall use the best available solar technology in the market. The phased-in construction strategy will enable CEPALCO to capitalize on the increasing efficiency but decreasing costs of solar cells which currently command not less than 60 percent of the PV plant's installed costs. It will also cushion the impact of generation costs on CEPALCO's customers.

If implemented according to plans, the first phase of the proposed 30-hectare solar park shall be commissioned by 2012 to augment the expected shortfall of firm capacity in Mindanao Grid.

12. NorthWind Power Development Corporation (NPDC)

The Philippines has been found to have potential wind power of 76,600 MW, leading other wind power-producing countries like Germany (14,000 MW potential wind power),

Spain and the US (6,000 MW each), Denmark (3,000 MW) and India (2,100 MW). A wind mapping study conducted by the United States National Renewable Energy Laboratory has found Bangui Bay in Ilocos Norte to be one of the areas across the country where 10,000 sq. km. of windy land exists with good to excellent wind resource potential.

NorthWind Power Development Corporation (NPDC) is a relatively new business organization involved in power generation but capitalizing on wind potentials in the Bangui Bay off Ilocos Norte in Northern Luzon. The wind farm project in Ilocos Norte was drawn in 1996 though a wind resource analysis and mapping study conducted for the Philippines by the National Renewable Energy Laboratory (NREL). The study showed that various areas spread in the Philippines are receptive to wind power installations. These areas include Bangui and Burgos towns in Ilocos Norte, Batanes and Babuyan islands also north of Luzon and the higher interior terrain of Mindoro, Samar, Leyte, Panay, Negros, Cebu, Palawan and eastern Mindanao.

NorthWind Power Development Corporation (NPDC) took advantage of the wind power potentials of the country particularly the Ilocos region by investing into the first wind farm in the country and in Southeast Asia. The wind farm established by NDPC in Bangui, Ilocos Norte uses wind turbines arranged on a single row stretching on a three-kilometer shoreline off Bangui Bay facing the South China Sea. The wind farm uses a 1.65 MW Vestas V82 wind turbines supplied by **Vestas Asia Pacific A/S**, the leading supplier of wind turbines in the world. The turbines are on-shore and arranged in an arc spaced about 326 meters apart. Other technical details of the wind turbines are shown in Table 5.

Table 5. Specifications of wind power system of NPDC

Turbine's hub height***	- 70 meters
Blade length	- 41 meters
Rotor diameter	- 82 meters
Windswept area	- 5,281 square meters

*** Ground level to center of nacelle

The turbine are oriented facing the sea, effectively eliminating windbreaks and achieving terrain roughness of class 0.

Annual generation capacity	- 74,482 MWh
Wind turbine arrangement	- Single row
Spacing	- 326 meters
Orientation	- North
Prevailing wind direction	- Northeast

Harnessing the strong winds coming from the north-northeast of the country, the wind farm is the largest wind power project in Southeast Asia. A first in Southeast Asia, the wind power plant is now composed of 20 turbines, each standing 70 meters or equal to the height of a 23-story building. The wind farm can generate a maximum capacity of 33 MW. The company is considering another 40-megawatt wind-power project in Cagayan province also in Northern Luzon in the next two years.

The first phase of the project started with 15 wind turbines in 2000 with an aggregate capacity of 25 Megawatt and a 69-kilometer transmission line to the Ilocos Norte Electric Cooperative in Laoag City. In June 2008, NPDC added five more turbines, raising the wind farm's capacity to 33 MW.

12.1 Funding the NPDC project

Initially, the funding that was provided by NPDC for 5 turbines, which is equivalent to 8 megawatts. Eventually, the Danish International Development Agency (DANIDA) partially funded the first phase of the Bangui Bay project. All 15 wind turbines under Phase 1 project are connected to the Luzon grid, and have been delivering power to the Ilocos Norte Electric Cooperative. The second phase comprising of additional five turbines is an additional investment of NPDC amounting to US$13 million and total project cost now amounted to US$ 50 million.[7]

In all, DANIDA shelled out $29.35 million of the $50-million project cost through a zero-interest mixed-credit facility, which was complemented by a guarantee from the Philippine Export-Import Credit Agency. About $10.5 million came from grants, while the balance was put in by NPDC shareholders. NorthWind's major shareholders include Moorland Phils., Phildane Resources Corp. and Fabmik Construction and Equipment Corporation.

12.2 NPDC expansion and creation of a new subsidiary

To handle its expansion project, NPDC has created a new subsidiary to take charge of its expansion program in the Cagayan area worth $95 million. NPDC will put up a 40-megawatt (MW) wind farm project in Aparri, Cagayan this year (2009). The company is bullish in expanding their capacity with the passage of the Renewable Energy Law. For its expansion project, NPDC may tap the Danish government and other investors and creditors for the Cagayan wind project. The company also expects to tap Japanese and Spanish investors and creditors. Former Energy Secretary Vincent Perez now of Alternergy said with the growing interest in renewable power sources, an increase in foreign investment is projected for renewable projects in emerging countries. Perez, who is also chairman of energy advisory firm Merritt Partners and managing director of renewable power developer Alternergy, said that investments in renewable energy sources such as wind, hydro and solar power is expected to pick up. After an extensive road show in the US, Middle East and Europe, Perez group were able to identify $150 million in equity commitment into Alternergy from foreign investors primarily for wind power development.

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[7] www.northwindpower.com

12.3 Sale price of NPDC power output

The only market for now of the electricity output of NPDC is the Ilocos Norte Electric Cooperative (INEC) with which is has existing **Renewable Energy Sales Agreement** (RESA). The distribution system of NPDC's wind farm is embedded in the INEC grid and thus negated the power-delivery charges of the National Transmission Corporation (TRANSCO) and it is considered a savings for INEC. NPDC has a pending accreditation with WESM where other than INEC as a market, excess power output of NPDC can be sold in the spot market being administered by WESM.

As stated in the RESA, NPDC will extend a 7-percent discount to INEC benchmarked against rate of the National Power Corporation (NPC). This pricing scheme will reduce the power charges being paid by Ilocos residents. The wind energy produced by the Bangui wind farm of NPDC translates to a 7 percent reduction in power costs from prevailing rates or a 5 percent discount of the weighted average price in the wholesale electricity spot market (WESM).

On top of reduced power rates, the wind farm will pave the way for the entry of additional investment opportunities whose operations depend on good power quality. The province's unstable power would force the Coca-Cola Bottlers' Company to avoid switching to INEC's power line due to low voltage between 5 to 10 p.m. The bottling company is one of the few huge power-dependent companies in the province.

The Bangui Bay wind farm project sells electricity to the Ilocos Norte Electric Cooperative and it now provides 40 percent of the power requirements of the province of Ilocos Norte and gradually increasing by 70 percent once Phase II is completed.

12.4 Carbon credit for NPDC

The electricity that NPDC generates will displace green house gas emissions such as carbon dioxide by approximately 65,000 tons per year. It is the first to be registered with the executive board of the United Nations Framework Convention on Climate Change- Kyoto Protocol. When carbon credits are duly accredited and issued the appropriate Certificate of Emissions Reduction (CER), the same can be traded in the carbon market. CERs are the carbon offset credits generated under the **UN Clean Development Mechanism** (CDM) for emissions reduction investment in developing countries. CERs are bought by developed countries and their firms to count towards their own domestic emissions targets.

The prices of Certified Emissions Reductions (CERs) in the global carbon markets ranges from US$ 10 – US$ 30 per tonne. In the Europe carbon, price was around €9.60 as of December 2008.[8]

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[8] http://www.carbonpositive.net/viewarticle.aspx?articleID=137

If the CER of NPDC is sold at low market price of US$ 10 per tonne, the annual carbon equivalent production of NPDC translates around US$ 650,000 per year or estimated to be about US$ 6.5 million over a 10 years period.

The ERC lauded NPDC for investing in eco-friendly renewable energy projects for cheaper electricity service as well as clean and green environment. With its compliance to the technical, financial and environmental standards set by law, electricity consumers in the area are assured that the ERC has carefully reviewed the safety and reliability of the NPDC's wind farm facilities.

12.5 LGU efforts paid off

The electricity supply from NPDC was a welcomed development by the local government unit (LGU) and the provincial officials. Already, business developers have started discussing potential industries with the provincial government ranging from glass to cement plant in eastern Ilocos Norte towns. It was Ilocos Norte Gov. Ferdinand Marcos, Jr., who, as a congressman back in the 1990s, pursued aggressively the development of a power plant in the province. The governor had previously disclosed that Ilocos Norte had let loose potential investors in the past due to poor power quality in the province. Governor Marcos had always complained then from NPC to do something about its power service, but to no avail. At present, Ilocos Norte is most affected during power outages because it is found at the end of the power grid coming all the way from Bauang, La Union.

12.6 Contribution of NPDC to the grid

NPDC's aggregate installed capacity of 33 MW is only 0.33 percent and 0.25 percent of the Luzon grid and the national grid, respectively. This share provided by wind energy in terms of generation capacity is way below the current limit set by the ERC. These figures may be considered miniscule but when one looks at the fact that the electricity production of NPDC supplies 40 percent of the power needs of INEC with potentials to supply up to 70 percent of the province's need, the contribution of NPDC is substantial.

The ERC must ensure that a generating company does not exceed the market-share limitations in the grid set at 30 percent where it operates and in the national grid set at 25 percent. The ERC determines the compliance of a generating company to the market-share limitations by determining the maximum load-carrying capability of the facility operated by the generation companies on a yearly basis. To prevent anti-competitive behavior, the ERC ensures that an electricity generation company does not exceed the market share limitations in the grid (set at 30 percent) where it operates and in the national grid, which is set at 25 percent.

12.7 NPDC awards

For its pioneering efforts in the area of wind power development, NPDC has been accorded a number of recognition and awards both by local and international bodies. Among these awards and recognition are the following:

a) Green Energy Award. For Renewable Energy On-Grid Electrictricity Generation. Awarded by the Department of Energy and the Center of Excellence for sustainable energy in Southeast Asia. Mandarin Oriental Manila, 2006.

b) Green Energy Award. Special citation: For exemplary achievement as a pioneer commercial wind farm in the Philippines, the largest in Southeast Asia, and for being the first Philippine Renewable Energy Project to be covered with an Emission Reduction Purchase Agreement (ERPA). Mandarin Oriental Manila, 2006.

c) 2005 ADFIAP Development Award for Local Economic Development. Given to Philippine Export-Import Credit Agency (Phil-Exim) recognizing their support for the realization of the 25MW Northwind Bangui Bay Project.

d) Model Corporate Citizen Award. Given by the Governor of the Province of Ilocos Norte. Laoag City Provincial Capitol, 2006.

e) **Renewable Energy Project Competition.** 1st Runner Up: On-grid Category. Awarded by the ASEAN Center for Energy. Vientiane, Lao PDR, 2006.

Other than the abovementioned citations, the World Bank (WB) has cited the success of NorthWind Power Development Corporation in generating electricity through the wind power technology in Bangui Bay, Ilocos Norte.

13. Ilocos Norte Electric Cooperative

Ilocos Norte Electric Cooperative (INEC) is consumer-level electric power provider in the northern-most province of Luzon province once sourcing its electricity from the National Power Corporation (NPC). INEC has a power demand of 32,425 KW (substation capacity) with a load factor or 58.76 percent. As of February 29, 2008, INEC has energized all the 21 municipalities of Ilocos Norte including Laoag City and City of Batac posting a record of 100 percent energization of the province and 100 percent of the province's 557 villages (barangays).

The electric cooperative used to source its power from the Luzon grid of the National Power Corporation (NPC) who provide electric power to all over the Philippines. In 2001, INEC linked up with the **NorthWind Power Development Corporation** (NPDC) – the first wind-power producer in the Philippines. At the time of initial link up in 2001, NPDC had a rated capacity of 24.75 MW from its 15 wind turbines. This capacity increased to 33 MW with the addition of 5 turbines more. The Bangui bay wind farm of NPDC generates power at wind speeds averaging 7 meters per second. NPDC's wind farm can help reduce INEC's system loss by improving its stability, electric quality and reinforce its transmission system through a 50-kilometer, 69,000-volt line constructed by NPDC.

13.1 Energy supply mix of INEC

The availability of wind power-based electricity provided by NPDC made it possible for INEC to diversify its power sources aside from NPC and its own mini-hydro power plant. As of the year end 2005, the energy supply mix of INEC is shown in Figure 12. As shown in Figure 12, from zero contribution in the early part of 2005, the contribution of wind power rose to 25 percent by year end 2005. As power from INEC sourced from wind resources increased to 25 percent, electric power sourced from NPC reduced to only 71 percent from 93 percent in early 2005 (refer to Table 5).[9]

The details of the energy supply mix of INEC is shown on Table 5. As Shown in Table 5, the energy sourced from its own mini-hydro plant appeared to be fluctuating, and in fact, reducing in term of share. Clearly increasing in terms of magnitude and per cent share is the energy supplied by wind power thru NPDC indicating the critical role played by wind energy technology.

13.2 INEC benefits from wind power

It is indeed a blessing for INEC to be the beneficiary of the electricity from wind sources owing to the following benefits:

a) An electricity source cheaper in acquisition cost about 7 percent lower than its usual energy source (i. e., National Power Corporation). This lower rate is passed on to the consumers of INEC's electric power;
b) Savings on the part of INEC on account of transmission cost usually budgeted or paid to TRANSCO. NPDC's power output in embedded into the INEC transmission system thus negating TRANSCO fees. The connection and power sourcing from the wind-farm project generated a savings of approximately $2.54 million for the consumers of the INEC in 2006 and 2007. The savings happened since NPDC was embedded in the INEC grid and thus negated the power-delivery charges of the National Transmission Corporation (TRANSCO).
c) An assurance of localized energy source with potentials to displace up to 70 percent of INEC's power demand and hopefully means more long-term monetary benefits to INEC and its customers;
d) The energy from the wind farm of NPDC supplies the energy needed by INEC thus addressing the voltage fluctuation problem in the INEC service area which in the past they complain about.

13.3 INEC's concerns on the spot market

The EPIRA Law calls for the establishment of the Wholesale Electricity Spot Market (WESM) wherein electric requirements of electric cooperatives has to purchase from the spot

[9] www.erc.gov.ph – ERC Case No. 2005 019 RC, p. 9

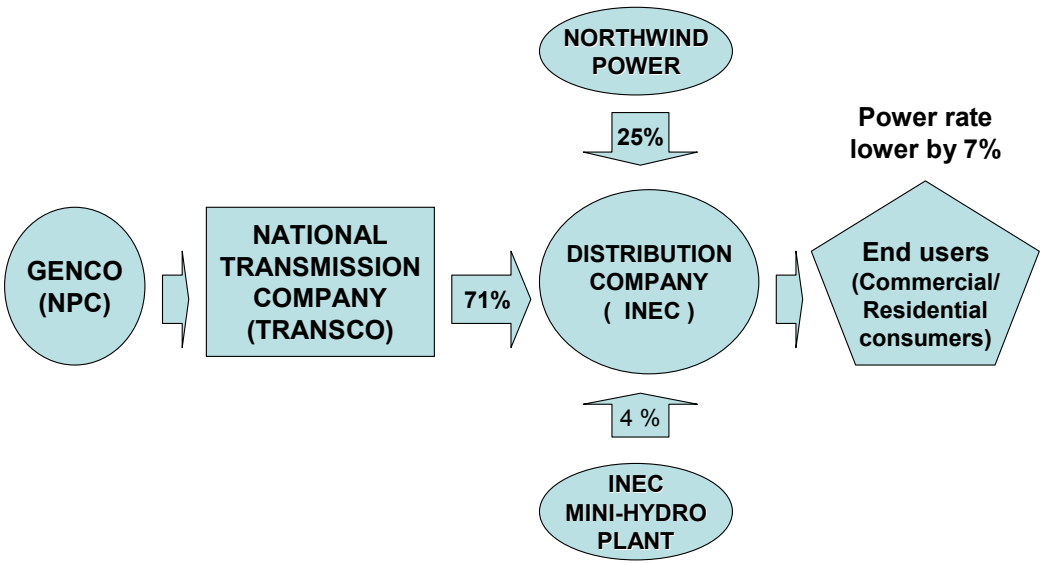

Figure 12. The INEC energy supply mix (as of December 2005)

Table 5. Energy supply mix of INEC (2005)

Months	Mini Hydro (kWh)	% share	NPC (kWh)	% share	NorthWind (kWh)	% share	Total (kWh)
January	906,220	7%	11,961,974	93%	0	0.00%	12,868,194
February	587,200	4%	12,743,614	96%	0	0.00%	13,330,814
March	657,670	5%	11,943,508	95%	0	0.00%	12,601,178
April	450,060	3%	15,762,013	97%	20,789	0.13%	16,232,862
May	249,180	1%	15,660,217	93%	849,165	5.07%	16,758,562
June	201,600	1%	14,500,913	91%	1,268,114	7.94%	15,970,627
July	138,600	1%	13,738,983	87%	1,850,940	11.77%	15,728,562
August	195,300	1%	13,487,345	87%	1,769,442	11.45%	15,452,087
September	174,300	1%	12,795,817	86%	1,826,552	12.34%	14,796,669
October	137,600	1%	11,176,063	78%	3,037,368	21.16%	14,351,031
November	319,200	2%	11,497,740	76%	3,404,884	22.37%	15,221,824
December	621,600	4%	9,930,433	71%	3,442,196	24.60%	13,994,229
Total	4,638,530		155,198,620		17,469,450		177,306,600
Average		2.75%		87.51%		9.74%	

Source: Energy Regulatory Commission./ www.erc.gov.ph

market through electronic bidding. In its initial implementation, INEC has applied as one of the pilot electric distribution utilities and the first electric cooperative to participate in the WESM. However, INEC appears to be not so excited about this possibility.

As per the WESM rules, electric cooperatives are required to purchase at least 10% of their energy requirements from the spot market. At present, INEC's energy requirements are purchased from the National Power Corporation (NPC) and NPDC as well as INEC's own Mini-hydro Power Plant. During the trial operation by INEC personnel with the WESM system, it was observed that there are times that the price of electricity in the spot market is higher than the NPC price but there are also times that the price of electricity is lower. In the WESM operation, distribution utilities are required to submit their bids for their energy requirements one hour ahead, thus, the price of electricity that INEC will purchase from the spot market will change every hour. To closely monitor the prices of electricity in the spot market, there is a need to man the INEC Energy Trading Office for 24 hours. This project is a new concept in the Philippine electricity industry but it aims to reduce the rate of electricity because of the competitive bidding. To date, several assets of NPC have already been privatized, the most recent of which is Magat Hydroelectric in the province of Isabela acquired by the Aboitiz Group of Companies. Given this scenario, it is possible that the 7 percent discount rate from NPDC and the spot market prices WESM as well as renewable energy sales agreements with NPDC may have complications that can potentially jeopardize the concern of INEC to serve its customers through affordable prices.[10]

According to the ERC legal office, there is now a legal case filed by NPDC and this concerns the refusal of INEC to settle the entire bill submitted by NPDC to INEC.[11]

14. Montalban Methane Power Project

Other than the solar photovoltaic plant of CEPALCO and wind-powered generation system of NPDC, the Philippines takes pride in the methane-powered facility that is connected to the distribution utility (MERALCO). In previous years, the country had a number of biogas/methane project considered commercial in scale but now of these projects was ever connected to the electricity grid. The Montalban Methane Power Corporation (MMPC) is a project of First Balfour, Inc., one of the power/energy companies belonging to the Lopez Group. The project makes use of the garbage from Metro Manila that is dumped at the landfill facility located in Montalban, Rizal. MMPC has secured an agreement with the local government of Rizal Province to put up the country's first waste-to-energy power plant in Rodriguez (formerly Montalban) landfill site. MMPC will capture the landfill gas or methane from the 14-hectare landfill to produce electricity enough to provide 15,000 households with power. The methane-powered facility operationalized in July 2008 and no less that President Gloria Macapagal Arroyo launched the project.

The project is a build-own-and operate (BOO) project and Monark Equipment Corporation (MEC) was commissioned to put up the power plant for the project. First Balfour

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[10] www.inec.gov.ph

[11] Per phone conversation with Atty. Adriano of ERC Legal Office (23 March 2009)

will be responsible for the installation of nine (9) units of generator set with 2MW capacity each but derated at 850 KW using methane as fuel. The project scope included construction of the powerhouse building, equipment foundations, piping works for fuel/gas header, condensate and cooling water, cabling works, small power and lighting, plumbing, ventilation system and monitoring system.[12]

Methane-based project in the Philippines is not really new in the country but this particular scale and kind of project is the first of its kind in the Philippines and one of the largest in Asia. With an estimated construction cost of $30 million, it is expected to generate 15 megawatts of power over 10 year. MMPC officials said that at least 1,500 metric tons of garbage would be needed to sustain the plant's operations. Increasing the volume of trash to 2,500 metric tons can extend production to 10 years instead of just five years.

The company plans to sell its power to Manila Electric Co. and the Wholesale Electricity Spot Market. The project expects to generate an income of US$ 50 Million. In addition, it can earn some more once it qualifies as a Clean Development Mechanism project under the United Nations Kyoto Protocol, and will generate at least 500,000 Certified Emission Reductions.

The methane gas facility of MMPC follows the Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) initiative and provides carbon credits for developed countries under category of projects that reduce emissions in developing economies under the Clean Development Mechanism. Furthermore, the power plant project is a candidate for a Gold Standard (GS) Clean Development Mechanism status.

15. More wind power projects

San Carlos Wind Power Corporation, a Filipino-Danish joint venture, is investing P2.987 billion for the construction of a 30-megawatt wind power project. This is the third new and renewable energy project approved by the Board of Investments. The project would be located around Mount Malindog in Barangays Linubagan and Prosperidad, San Carlos City, Negros Occidental, which is 700-800 meters above sea level. BOI approved the project on a pioneer status having met the minimum investment requirement for wind technologies at $1.25 million.

For the development of the project, the partnership between Smith Bell Wind Technologies, Inc. and Global Renewable Energy Partners was put together to establish and organize the San Carlos Wind Power Corporation. San Carlos wind farm will comprise of 16 to 20 wind turbine generators each with a capacity of 1.5 to 2 MW with a total rated capacity of 30 MW. When operational, San Carlos intends to sell the generated power to the electric distribution facilities in the Negros and Panay sub-grids. Of the total cost, the firm intends to spend P1.7 billion for the acquisition of turbine, while the rest will be used for the construction and development of the facilities. Bulk of the cost at P2.2 billion is expected to come from loans, while the rest from equity. The project is also seeking Danish foreign aid in the form of grant on interest payments, and from European banks.

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[12] www.firstbalfour.com

San Carlos is the third wind power project to be registered with the BOI. The other two projects, also approved on pioneer status, are the 40-MW Northern Luzon Wind Project of PNOC-Energy Development Corp. and the of North Wind Power Development Corporation.

16. Wind Power Contracting Round

To further entice investors in renewable energy technologies, the Department of Energy has employed creative means fashioned after the oil concessionaire system. DOE has launched the **Wind Power Contracting Round** that offered 16 wind sites. Three companies earlier awarded pre-commercial contract (PCC) to harness the country's wind energy are now conducting actual wind assessment under their respective work programs. Philippine Hybrid Energy Systems, Inc. was awarded three PCCs for wind projects in Marinduque; Baleno, Masbate; and Tablas, Romblon with a combined 30MW of capacity. Trans-Asia Renewable Energy Corporation was also awarded a contract for a potential 30-MW wind project in Sual, Pangasinan and San Carlos Wind Power Corp. in San Carlos City, Negros Occidental for a 25MW wind farm. Companies that bid for the 11 other sites are now in the process of securing PCC at the Department of Energy.[13]

17. Financial support mechanism for NRETs

With many renewable energy technologies now in mature and commercial stage particularly solar and wind technologies, the next constraints and obstacle to its widespread use is more of financial and economic considerations.

It is, therefore, important to provide a financial support scheme and incentive to address investors concerns. It is along this premise that renewable energy development programs in the Philippines has given substantial emphasis on the financial support scheme particularly on credit availability as well as incentives in the form of duty-free importations and tax holidays. Aside from the pre-operating incentives, renewable energy projects in commercial operations are given additional incentives when the project is covered by the Incentives Act or the Investment Priorities Plan (IPP) being administered by the Board of Investments.

The above concerns are even more emphasized and concretized in the form of financial support schemes as well as incentive measures are enshrined under the Renewable Energy Law of 2008. Following are some of the elaborations in this regard.

17.1 Financial support under the RE Law

To encourage investors to venture into renewable energy projects, the Renewable Energy Las made specific provisions on financing commercial projects as provided for under Section 29 which reads as follows:

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[13] Department of Energy, 2008

SEC. 29. ***Financial Assistance Program.*** **– Government financial institutions such as the Development Bank of the Philippines (DBP), Land Bank of the Philippines (LBP), Phil-Exim Bank and other government financial institutions shall, in accordance with and to the extent allowed by the enabling provisions of their respective charters or applicable laws, provide preferential financial packages for the development, utilization and commercialization of RE projects as duly recommended and endorsed by the DOE.**

The Development Bank of the Philippines has financing packages under its **Wind Energy Financing Program**, **RE Project Preparation Revolving Fund**, **Rural Power Project for Type A Beneficiaries**, **Rural Power Project for Type B Beneficiaries** and **CDM Initiatives**.

Philippine Export-Import Credit Agency (PhilExim), for its part, provides loan guarantees to selected wind power projects such as the Bangui Bay wind farm.

17.2 Available financing from private sector

Even prior to the enactment of the Renewable Energy Law, the commercial banking system in the Philippines has available commercial loans and financing schemes given the fact that products of energy-based project are always in demand.

It is a matter of practice among private commercial banks to support and finance renewable energy projects that are bankable or who cash flow and income stream cash support the business venture and it appears some these technologies are already in the stage.

17.3 Financial support from external parties

Large-scale or commercial renewable energy-based power generation technologies are somehow expensive and come with techno-economic apprehensions. Hence, support of external parties, both from bilateral and multi-lateral sources are considered of great help.

Other than the availability of domestic funds from the banking and financial system, international or foreign-based sources also offer financial assistance such as the Global Environment Facility (GEF) and International Finance Corporation of the World Bank (WB/IFC) who provided the funds for the photovoltaic power plant of Cagayan Electric Power and Light Company (CEPALCO) in Cagayan de Oro City.

The **United Nations Development Programme-Global Environment Facility (UNDP-GEF)** also offers assistance in project preparation and in securing loan guarantee for the project.

Developed countries and donor organizations noticed the growing energy demand hence the Asian Development Bank and its development partners are setting up a facility that would provide seed capital for renewable energy and energy efficiency projects in the Asia-Pacific region.

Asian Development Bank said it would develop the **Seed Capital Assistance Facility** that would be initially funded by a $4.2-million grant from the Global Environment Facility, a

global partnership established in 1991 to help developing countries fund projects that protect the global environment. The seed capital assistance facility would be jointly managed by ADB and United Nations Environment Programme. The ADB said the facility would "provide technical assistance to private equity fund managers and entrepreneurs to develop sustainable clean energy funds and financing for the early stages of such projects, share in the costs of development and transactions, and encourage taking riskier portfolios through a seed capital return enhancement offered on a per-project basis. It further noted that the facility would increase access to financing at the early stages of sustainable energy enterprises and projects around the Asia-Pacific region. With increased experience among financiers in investing in small-scale renewable energy and energy efficiency projects, mainstream energy investors would be encouraged to invest more in clean energy enterprises and projects.[14]

18. Technical and economic efficiency

Renewable energy technologies in general suffer the perception of relatively low technical efficiency and hence the economic/financial efficiency as well. Technical efficiency for solar photovoltaic system stands at just a little above 10 percent with wind energy conversion systems limited by Betz coefficient that leads to a maximum theoretical efficiency below 60 percent. Adding demerit to this low technical efficiency is the fact that these systems produce direct current (DC) type of electricity as against the alternating current (AC) type of current demanded by the grid and system loads. Output of solar photovoltaic and wind power system have to be converted to AC electricity thus increasing initial system costs and thus affecting financial/economic efficiency computations even as the inputs (sun and wind) is available for free courtesy of Mother Earth.

The policy of the Philippine government, as enshrined it the Renewable Energy Law and other laws earlier enacted makes it attractive to renewable energy power system generators. Outputs of renewable energy systems can be connected to the regional electricity grids hence allowing the supply of NRET-generated power to be distributed or sold elsewhere too far away from the point of power production – realities which could have been too costly for alternative/renewable power generation system due to technical losses. This interconnection scenario, therefore, takes care of the limitations and low competitiveness of the NRETs vis-à-vis the traditional petroleum-based power generation system. It is in this light that renewable energy-based power generation system becomes somehow competitive as it can even serve a balancer to voltage instability in some areas served by the grid as in the case of the situation of Ilocos Norte province.

With the output of the photovoltaic plant of CEPALCO forming part of the power supply and distribution lines of the company as well as the electric power output of NPDC embedded in the distribution grid of INEC, the question of low technical efficiency is now a foregone issue as in fact, the output of these facilities serves as voltage stabilizers aside from the financial/economic benefits it provides on top saving some operating expenses on account of savings from wheeling charges from TRANSCO.

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[14] www.adb.org

18.1 Margin advantage for NRET electricity

Unlike tariff rates charge by distribution utilities and electric cooperatives which are explicitly regulated under the provisions of the EPIRA Law and other ERC regulations, electricity outputs or rates of power generators from renewable energy sources is some treated differently though implied to be considered regulated under the rate setting mandate of ERC. As such, the profitability of operations of renewable energy-based companies is not controlled or curtailed hence very much attractive and motivating for investors. It can be said then that potentially or in reality, financial/economic attractiveness or efficiency is expected to be relatively high on account of the expected higher return on investment levels that it can set as compared to electricity distribution business – and this scenario favors the investors in NRET-based projects.

The above notion is explained by the current situation of both CEPALCO and INEC. The photovoltaic system of CEPALCO is part of its power plant as distribution utility at the same time as generating company. The company owns and operates hydro and photovoltaic plant whose output is part of the electricity it supplies to its institutional/residential consumers. This being the case, CEPALCO is not necessarily required to divulge the costs and returns of the PV generation facility hence there is really no way of knowing whether the priced charge by the PV facility is sky high or not. The same is true with the electric power out of NPDC which is sold to INEC by way of an Energy Sales Agreement (ESA). The ESA assures NPDC a market outlet and guaranteed price benchmarked against the NPC rate at a discount rate of 7 percent. It was INEC who petition and clear up with ERC the ESA who eventually approved the 20-year ESA between INEC and NPDC. When NPC is fully privatized, the same discount rate will apply but benchmarked against the going electricity rate in the province as the buyer of NPC interest inherits the provisions in the ESA. What is not factored in the determination of cost of electricity sold by NPDC to INEC is money equivalent of the CERs which NPDC can sell to the carbon market. This is somehow a gray area which in the view of the author is favorable to the renewable energy generators like CEPALCO and NPDC.

A very important aspect and motivating factor in constructing and operating a renewable energy-based company is that aside from sales from electricity, the generator can earn substantial income from the sale of carbon credits if the firm is duly certified by appropriate bodies to be qualified for **Certificate of Emissions Reductions** (CER). These reality is substantial if not more than enough to offset whatever inefficiencies NRET technologies may have. This appears to be an advantage that redounds to economic or financial efficiency and advantage as it steps up early recovery of investment apart from helping the host country improve its contribution to the **Kyoto Protocol**.

20. More investments renewable energy needed and expected

Envisioning a goal of having 4,500 megawatts of new renewable energy capacity in the next 10 years, the renewable energy sector will need some $8.5 billion in fresh investments. This investment required is even an estimate on the conservative side. Director Mario Marasigan of the Department of Energy's energy utilization and management bureau, expressed confidence saying that that investors would find the renewable energy sector quite lucrative, particularly when the implementing rules and regulations for RA 9513, or the Renewable Energy Act of 2008, is finalized by June.

Right now, DOE may not have an exact handle on the number of investors that were seriously interested in investing in renewable energy projects. What the department knows at this point are the renewable energy projects that are most attractive to potential investors, he said. Most of these investors are looking at wind, hydro, geothermal and biomass, including solid waste-to-energy concepts, and biofuels. At least one company is interested in ocean energy thermal conversion.[15]

The finalization of the Implementing Rules and Regulations (IRR) for the Renewable Energy Law should prompt potential investors to finalize their investment plans in the sector. The IRR is expected to be completed by June 2009,ahead of the July deadline set by the law. The law is widely expected to spur investments in the renewable energy sector, due mainly to incentives that are offered to potential investors. Some of these incentives are exemptions from tariff duties and zero-rated value-added tax for the importation of machinery and equipment for the first 10 years of an operating contract, as well as tax credit on domestic capital equipment and services. Special realty tax rates will also be imposed on equipment and machinery to be used for renewable energy development. An income tax holiday will also be granted to potential investors for the first seven years of operations.[15]

21. Success factors in the Philippines NRET programs/projects

Whatever experiences and successes as well as failures the Philippines may have on NRET matters is a combined products and results of political will in developing the National Energy Plan that it keeps to continually update. This would have been impossible where it not for a variety of legislatives and administrative provisions to support the attainment of the vision set forth in the energy plan.

The global developments and the volatility of the global markets for petroleum products was a dilemma but in some ways served as untiring reminder on the need to continually pursue efforts on developing the potentials of renewable energy sources as a potent component of the projected generation capacity and eventually the energy supply mix. The efforts made in the area of commercializing the gasification technology, commercial experiences in biogas technology, the progress made in developing coconut-based fuel from a pure CNO-diesel fuel mix to coconut methyl esters (biodiesel), the initial failures in small-scale wind power projects as well as the pilot projects in the area of photovoltaics all contributed to the initiation and commercial-scale ventures in solar and wind power projects that is now generating megawatt-level capacities already connected to the grid system.

To name a few then, the following factors may have greatly contributed to the commercial use and megawatt level power generation projects using renewable energy sources:

a) Availability and abundance of natural resources (e. g., solar, wind, biomass);
b) Political will and government policy pronouncements on private sector participation in the area of power generation resulting to privatized power generation system.

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[15] Ho, A., $8.5B in renewable energy investments needed, Philippine Daily Inquirer, March 23, 2009

c) Commitment to pursue research and development as well promotional development efforts to popularize and commercialize the use of renewable energy sources;
d) Existence of a number of laws and administrative interventions principally incentive schemes thus favoring investments and private business ventures in the power sector;
e) Availability of foreign/local financing support schemes (e. g., loans and grants from DBP, LBP, WB/IFC, DANIDA, etc.) to augment local financial limitations;
f) Existence of guaranteed or captive markets as well as government assurance to ensure reasonable returns to private investors;
g) Support of local government units in concretizing the intents and purposes built into the national energy plan;
h) External pressures in terms of volatile global markets and environmental concerns (e. g., Kyoto Protocol, etc.) that favorably offsets the economic disadvantage of some renewable energy technologies;
i) Existence of mature and commercial technologies using renewable energy sources;
j) Willingness of local and foreign investors as well as concerned entrepreneurs who cares for clean energy and environment-friendly power generation technologies.

22. Summary

If there is any success in the development of renewable energy technologies in the Philippines resulting to establishment of megawatt-level capacity power plants, this can be traced to a number of incentives and mandatory provisions of laws as well as series of efforts done by the government commencing back in the late 1970s all the way to present time. The variety of laws like the Investment Act, BOT Law, Biofuels Law, EPIRA Law, Clean Air Act, Ecological Solid Waste Management Act, and most recently, the Renewable Energy Law, are indications of the commitment of the Philippine government to make renewable energy take a role in the country's energy generation capacity down to the energy supply mix. These efforts appear to have been well received by the private sectors such that ownership and management of power generation is now largely in the hands of the private sector. A number of investments has been made by foreign or international organizations including the World Bank's International Finance Corporation who supported the CEPALCO photovoltaic project and DANIDA who partly financed NPDC's wind power project.

The 33-MW production of NPDC using wind energy potentials of Bangui in Ilocos Norte is the biggest in Southeast Asia and the first venture accredited with a Certificate of Emissions Reduction (CER). Its connection to the electricity grid with potentials to supply up to 70 percent of the electricity demand of the province of Ilocos Norte is worth noting and encouraging for other prospective investors. The company's plan to put up more wind generators of 40 MW in Cagayan province also in Luzon is a living proof that the wind energy conversions system is indeed a mature technology and one that is now tested successfully in the Philippines.

For solar energy technology by photovoltaics, the 1 MW solar photovoltaic plant is another first of a kind in Southeast Asia that is also connected to the grid and now playing a key role in supplying the electricity needs of the service area of CEPALCO. No less than World Bank's IFC has given positive endorsement of the project for its success. The plan of CEPALCO to put up a much bigger solar park capable of generating 10 MW is an indication of an encouraging financial returns to the company.

Being a new project and unique in the sense that power generation is part of CEPALCO business activity and with RESA scheme to guarantee a market for the electricity output of NPDC, true costs and returns figures of the two NRET power plants (by CEPALCO and NPDC) remain confidential given the fact that these organizations are private commercial ventures. Nonetheless, the expansionary attitude these companies are doing is indicative of a bright future for these ventures giving the fact that outputs of their plants can be easily sold or disposed through the electricity grid system.

The climate change mitigation contribution of the 3 major projects mentioned is an annual carbon generation of 65,000 tonnes equivalent for NPDC. Throughout the projects life, MMPC projects to produce an equivalent of 500,000 tonnes with CEPALCO which stand to produce 10,000 tonnes equivalent. When traded in the carbon exchange market, it means additional income for the 3 companies which also mean compliance to the Kyoto Protocol on the part of the Philippines. Investment wise, it meant an investment of about US$ 88 million for the 3 NRET-based power project alone.

All the 3 renewable energy projects (CEPALCO, NPDC, MMPC) connected to the electricity grid are all supported by private investors with funding support from international financing institutions (e. g., WB/IFC and DANIDA) and local investors as well. This is an indication that even without financial support from Government Financial Institutions (GFIs) as mandated by the Renewable Energy Law, renewable energy projects connected to the electricity grid can take off, and in fact, the existing projects are into expansionary ventures.

In the meantime, the full implementation of the Renewable Energy Law with its Implementing Rules and Regulations (IRR) now being discussed and given the fact that the law mandates government financial institutions to make available its financial resources along with a variety of incentives to private investors, there is a reason to be optimistic both at the end of the local and foreign investors and the government as well.

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