

PHILIPPINES

2013

1. GENERAL INFORMATION

1.1 Country Overview

An archipelago of 7,107 islands, the Philippines stretches from the south of China to the Northern tip of Borneo. The country has over a hundred of ethnic groups and a mixture of foreign influences which have molded a unique Filipino culture. The Philippines are considered to be the third largest English speaking country in the world.

The country is divided into three geographical areas, Luzon, Visayas and Mindanao. It has 16 regions and 79 provinces. Its capital is Manila. The total land area is 299,404 km².

A former colony of the Spain and the United States, the Philippines is one of the two predominant Roman Catholic countries in Asia, the other being East Timor. There are also a number of minority religious groups, including Islam, Buddhism, Hinduism, and other religions. Multiple ethnicities and cultures are found throughout the islands. Ecologically, the Philippines are one of the diverse countries in the world.

1.1.1 Government System

The Republic of the Philippines is a constitutional democracy, with the President as head of state. The president and vice president are elected by the people for six-year terms. The national government has three equal branches that exercise a system of checks and balances: executive, legislative and judicial.

The executive branch consists of 26 cabinet, secretariat and equivalent ranks in specialized agencies, the national bureaucracy and the military, of which the president is Commander-in-Chief. The legislative branch of Congress is a two-chamber legislature. There are 24-senators in the Philippine Senate, while there are 287 Congressmen or House Representatives in the 15th Congress. The judicial branch consists of the Supreme Court, the Court of Appeals, Regional Trial Courts and other special courts (i.e. Juvenile, Family or Shari'ah Courts)

Sources: eTravel Pilipinas
Department of Tourism Promotions Board

1.1.2 GEOGRAPHY AND CLIMATE

The Philippine archipelago lies in Southeast Asia, in a position that has led to it becoming a cultural crossroads, a place where Malays, Chinese, Spaniards,

Americans and others have interacted to forge a unique cultural and racial blend known to the world as Filipino. The archipelago numbers some 7,107 islands, as the nation claims an exclusive economic zone (EEZ) of 200 nautical miles from its shores. The Philippines occupies an area that stretches for 1,850 kilometers from about the fifth to the twentieth parallels north latitude. The total land area is almost 300,000 km². Only approximately 1,000 of its islands are populated; and less than one-half of these are larger than 2.5 km².

The islands make up of 94 % of the Philippine land mass, and two of these – Luzon and Mindanao – Measure 105,000 and 95,000 km², respectively. They, together with the cluster of the Visayas islands that separate them, represent the three principal regions of the archipelago that are identified by the three stars on the Philippine flag.

Topographically, the Philippines are broken up by the sea, which gives it one of the longest coastlines of any nation in the world. Most Filipinos live on or near the coast, where they easily supplement their diet from approximately 2,000 species of fish.

Off the coast of eastern Mindanao is the Philippine trough, which descends to a depth of 10,430 meters. The Philippines is a part of a Western Pacific arc system that is characterized by active volcanoes. Among the most notable peaks are Mount Mayon near Legazpi, Taal Volcano, South of Manila and Mount Apo in Mindanao. All of the Philippines islands are prone to earthquakes. The Northern Luzon highlands or Cordillera Central rise to between 2,500 and 2,750 meters, and together with the Sierra Madre in the northern portion of Luzon and the mountains of Mindanao, boast rain forests that provide refuge for numerous upland tribal groups. The rain forests also offer prime habitat for more than 500 species of birds, including the Philippine eagle (or monkey-eating eagle), and some 800 species of flowering plants.

The country's most extensive river systems are the Pulangi (Rio Grande), which flows into the Mindanao River, the Agusan, in Mindanao which flows north into the Mindanao Sea, the Cagayan in Northern Luzon into Manila Bay. Laguna de Bay, southeast of Manila Bay, is the largest fresh water lake in the Philippines. Several rivers have been harnessed for hydroelectric power.

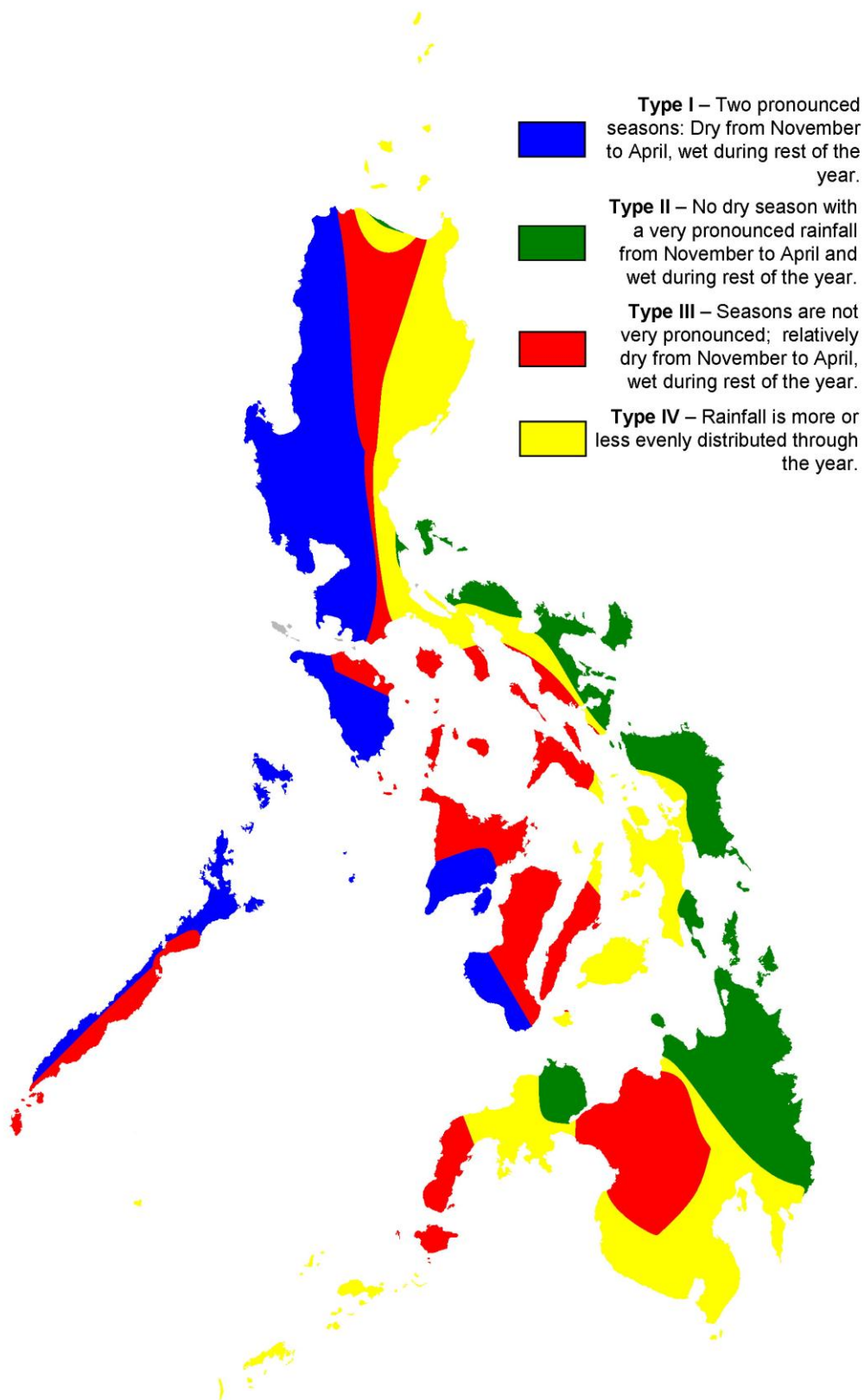


Figure 1. Map of the Philippines

The climate of the Philippines is a tropical marine climate dominated by a rainy season, a dry season and a cool season that dominates on November to mid-February. The summer monsoon brings heavy rains to most of the archipelago from May to October, whereas the winter monsoon brings cooler and drier air from December to February. Manila and most of the lowland areas are hot and

dusty from March to May. Even at this time, however, temperatures rarely rise above 37°C. Mean annual sea-level temperatures rarely fall below 27°C. Annual average rainfall ranges from as much as 5,000 mm in the mountainous east coast section of the country to less than 1,000 mm in some of the sheltered valleys. Monsoon rains although hard and drenching, are not normally associated with high winds and waves; however the Philippines sit astride the typhoon belt, and the country suffers an annual onslaught of dangerous storms from July through October. These are especially hazardous for Northern and Eastern Luzon, the Bicol and Eastern Visayas regions, with Manila getting devastated periodically as well.

1.1.3 POPULATION

The Philippines is the world's 12th most populous country, with a population of about 94 million people. Its national economy is the 45th largest in the world, with an estimated 2010 gross domestic product (GDP) Purchasing Power Parity of US\$351.4 billion. There are more than 11 million overseas Filipinos worldwide, an estimate of about 11% of the population.

More than 55% of the Philippine population is living on the northern island of Luzon, the National Capital Region (NCR) and part of Luzon, and is the most densely populated area of the country. More than 9.9 million (13.0%) people are living here. The total area of the National Capital area is 636 km² (0.2% of the country's total land area) and its density is 15.617 people per km².

Table 1. **POPULATION INFORMATION**

Year	May						Average Annual growth rate (%)
	1970	1980	1990	2000	2007	2010	2000 to 2010
Population (millions)	36.7	48.1	60.7	76.51	88.55	92.34	1.90
Population density (inhabitants/km ²)			202	255		308	20.7
Urban Population as % of total				48%	64%		
Area (1000 km ²)							

Latest available data

Source: National Statistics office, www@ncsb.gov.ph

1.1.4 ECONOMIC DATA

Table 2. **GROSS DOMESTIC PRODUCT (GDP)**

	May						Average Annual growth rate (%)
	1992	1980	1990	2000	2005	2010	2000-1 st Qtr 2013
GDP (billions of current US\$)	7.4	27.5	42.6	76.2	86.9	224.154	4.90%
GDP (millions of constant 2000 US\$)							
GDP per capita (PPP*US\$/capita)		1349.34	1766.92	7292	4139.92		19%
GDP per capita (PPP*US\$/capita)	426.19	966.16	895.66	940.88	1153.02	1410.78	11%

*PPP Purchasing Power parity

**Latest available data

Source: www.tradingeconomics.com/The National Statistics Coordination Board.

With the upbeat business and consumer sentiment, as well as sustained government capital expenditure, the Philippine economy posted a 7.8 % GDP growth in the first quarter of 2013 from 6.5 % the previous year. The Q1 growth is the highest so far under the Aquino administration and also the third consecutive quarter of more than 7.0 % GDP growth.

On a seasonally adjusted basis, GDP is gaining momentum grossing 2.2 % in the first quarter of 2013, GNI gross of 19 %. All major sectors posted positive growth in seasonally adjusted terms for the first quarter of 2013. With the country's projected population reaching 96.8 million in the first quarter of 2013, per capita GDP grew by 6.1 %, while per capita GNI grew by 5.3 % and per capita Household Final Consumption Expenditure (HFCE) grew by 3.4 %.

1.2 ENERGY INFORMATION

1.2.1 Estimated Available Energy

Table 3. ESTIMATED AVAILABLE ENERGY SOURCES (as of December 2012)

	Estimated available energy source					
	Fossil Fuels			Nuclear	Renewables	
	Solid	Liquid	Gas	Uranium	Hydro	Other
					Renewable	
Total amount in specific units*	32 units @ 10,000 BTU/lb	277 MBbl @ 18,500 BTU/lb	3,808CF @49.5 MJ/kg	-	9,788 GWh	80 GWh
Total amount in Exajoule (EJ)	7.571	1.515	4.271	-	0.352	0.003

Source: Energy Statistics, Department of Energy

1.2.2 Energy Statistics

Table 4. ENERGY STATISTICS

	1990	2000	2005	2007	2009	Average annual Growth rate (%) 2000 - 2009
Energy consumption**						
- Total, MTOE		39.9	38.5	38.9	39.6	0.4
- Solids MMTC@ 10,000 BTU/lb		8.762	10.075	10.215	11.494	6.0
- Liquids, MBbl		103.87	98.45	96.48	96.25	-1.1
- Gases, MSCF		376	115988	130210	138029	52
- Nuclear		-	-	-	-	-
- Hydro, MWh		7,799	8,387	8,563	9,787	7.0
- Other Renewables, MWh		11 317	9 921	10 274	10 403	0.07
Energy Production						
- Total, MTOE		19.3	21.2	22.0	23.5	2.4
- Solids MMTC@ 10,000 BTU/lb		1,353	3.164	3.737	5,176	16
- Liquids, MBbl		0.42	6.76	5.93	8.38	43
- Gases, MSCF		376	115965	130211	138030	52
- Nuclear		-	-	-	-	-

- Hydro, MWh		7,799	8,387	8,563	9,787	
- Other Renewables, MWh		11 317	9 921	10 274	10 403	0.07
Net import (Import-Export)	1990	2000	2005	2007	2009	2000 - 2009
- Total, MTOE		19.9	17.3	16.9	16.2	-1.9

AAGR – Average Annual Growth Rate (%)

KTOE – Kiloton Oil equivalent, MTOE- milliton oil equivalent

MSCF – Million std. cubic ft.

MMT – Million metric ton

MBbl – Million barrels

BCF – Billion cubic ft.

Source: Energy Statistics, Department of Energy

As the country faces the realities of growing energy demand, tight energy supply, limited foreign investments and critical power development issues, the Department of Energy is set to release the Philippine Energy Plan (PEP) highlighting the plans and programs of the energy sector to fuel support for the economic growth of the country for the period 2009-2030.

The plans and programs of PEP 2009-2030 will see to it that public policies of energy are at par with the changing needs of the energy sector.

As an overall guiding principle, the plan is based on three broad policy thrusts;

- a. Ensuring energy security
- b. Pursuing effective implementation of energy sector reforms and
- c. Implementing social mobilization and cross-sector monitoring mechanisms.

1.2.3. Energy policy

Since the path to energy security cannot rely on one option only, the PEP has laid out essential and urged steps to support the policy thrusts of the energy sector. Below are the plans for the 20-year planning horizon.

Exploration/Development of Conventional Fuels

The country's conventional energy fuels – oil, gas and coal – will continue to remain indispensable in meeting the country's energy demand, even as the country pursues other alternative energy sources.

1.2.3.1 OIL AND GAS

For fossil fuels, like oil and gas, the target production level at the end of the planning horizon is 78.59 million barrels. Service contracts, which to date total to about 34, will increase to 117 by 2030. Assuming the realization of these targets, hydrocarbon resources will increase 40% by the planning period. The country has 16 sedimentary basins and the majority of these areas are found in Luzon, particularly in Palawan.

1.2.3.2. COAL

Indigenous coal production will increase to a high 250% with the entry of more investors through the energy contracting round mechanisms and the conversion of existing coal operating contracts, from exploration to development stage.

Currently, the country imports around 75.4% of the domestic coal requirements.

1.2.3.3. RENEWABLE ENERGY

Renewable energy (RE) development was given a tremendous boost with the passage of the Renewable Energy Act of 2008. Since its signing, a total of 206 contracts have been signed. The target is to double the RE-based installed capacity to power generation at the end of the planning horizon from its 2008 level of 5,300 MW.

In the case of geothermal, a comparatively more advanced resource, the targeted installed capacity will increase from 1,972 to over 3,000 MW at the end of the planning horizon, to boost the country's leadership in geothermal energy development worldwide.

1.2.3.4. NUCLEAR

Worldwide, there is a revival of interest in nuclear energy as an alternative energy source. And along this line, the secretaries of the Department of Energy and the Department of Science and Technology jointly created an inter-agency task force to exactly determine the feasibility of considering nuclear energy as a long term option in the country. The task force validated the results of the Bataan Nuclear Power Plant (BNPP) feasibility study in 2009 which is the major deliverable of an Memorandum of Understanding (MOU) between the National Power Corporation and KEPCO. It also undertook the site safety review of the BNPP. A study on the competitiveness of nuclear power against other fuel sources will also be conducted and in the meantime the country is capacitating its manpower through various training programs.

1.2.3.5. Promoting Responsible Use of Energy

The government is developing opportunities to make realistic changes in the way the country uses its energy resources. Energy conservation programs and technologies will help Filipinos become efficient consumers of energy. For the energy efficiency program, the Plan aims to achieve 10% energy savings on the total annual demand of all economic sectors.

Other programs for implementation are the monitoring of efficiency performance of power generation utilities and electric distribution facilities, promotion of aviation fuel efficiency enhancement, retrofit of commercial and industrial establishments and voluntary agreement programs on the rationalization of tricycle operation.

1.2.3.6. Ensuring Developments in the Power and Electrification Sectors

Given the critical periods in the respective major grids of the country, between 2009-2030, the plan provides a list of projects that will come on stream at various timeliness. This will include committed projects as essentially having financial closure already and indicative projects as being in various stages of development. A

600 MW coal fired plant is a committed project for the Luzon and year of availability is in 2012. While for Visayas, two committed coal power plants will bring in 328 MW of additional capacity. Additionally, 4 additional power projects came in 2011, with an additional capacity of 325 MW. For the Mindanao region, the Sibulan Hydropower plant (42.5 MW) is expected to come on-stream as well as the Cabulig Hydropower Project (8 MW) this year; the Mindanao Geothermal Project (50 MW) is expected by 2014.

1.2.3.7. USING ENERGY IN AN ENVIRONMENTALLY RESPONSIBLE MANNER (CLIMATE CHANGE ADAPTION MEASURES)

The country, like the rest of the world, is facing a moment of decision in terms using energy in a more environment friendly way. Fully aware on the role and responsibility of the energy sector in helping mitigate the impact of climate change, the plan is introducing the pursuit of adaptation strategies, among which are the following: to conduct an impact and vulnerability assessment of energy systems such as power generation, transmission and distribution, fuel production and transport in the immediate term, integration of structural adaptations into the design of energy infrastructures to include modification of engineering design practices and integration of climate change adaptation to energy policies, plans and programs, including laws and regulations.

Source: Department of Energy Portal (www.doe.gov.ph)

1.3 THE ELECTRICITY SYSTEM

1.2.3 Energy policy

The energy policy reflects the state's commitments to pursue the energy independence agenda under the government five-point reform program package as shown in Figure 2. The first objective is anchored on the effective implementation of the following goals.

- (a) Accelerating exploration, development and utilization of indigenous energy resources.
- (b) Intensifying renewable energy resource development
- (c) Increasing the use of alternative fuels and
- (d) Enhancing energy efficiency and conservation.

Also, the continuing reforms in the power sector, as well as the downstream oil and gas industries, will pave the way in realizing a globally competitive Philippine energy sector.

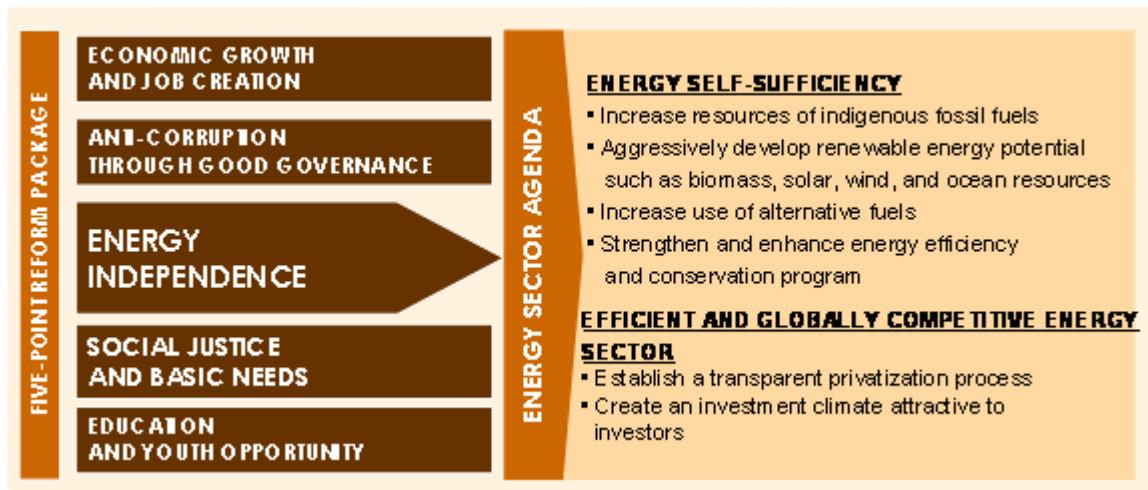


Figure 2. The Philippines' Five-Point Reform Package

1.3.1 Electricity Policy and Decision Making Process

The Philippine Distribution Code establishes the basic rules, procedures, requirements and standards that govern the operation, maintenance and development of the electric distribution systems in the Philippine Grid Code and the market rules of the Wholesale Electricity Spot Market to ensure the safe, reliable and efficient operation of the total electric energy supply system in the Philippines.

Republic Act No. 9136, also known as the “Electric Power Industry Reform Act of 2001”, mandated the creation of the Energy Regulatory Commission (ERC). Section 43(b) of the Act provides that the ERC promulgates and enforces a National Grid Code and a distribution code which shall include, but not be limited to: (a) Performance Standards for TRANSCO O & M Concessionaire, Distributors and Suppliers, and (b) Financial Capability Standards for the Generating Companies, the TRANSCO, distributors and suppliers. The act also mandates the ERC to enforce compliance with the Grid Code, the Distribution Code, and the Market rules and to impose fines and penalties for any violation of their provisions.

The restructuring of the electric power industry will result in significant changes in distribution system operation and management. The act allows end-users belonging to the contestable market to obtain power from suppliers who are licensed by the ERC. Distributors must provide wheeling services to these end-users. Distributors must also procure energy from the Wholesale Electricity Spot Market and through bilateral contracts to serve the remainder of the customers in their franchise area.

The distribution code defines the technical aspects of the working relationship between the distributors and all users of the distribution system. Distributors must deliver electric energy to the users at acceptable levels of power quality and customer service performance.

Source: Energy Regulatory Commission (Philippines)

1.3.2 Structure of Electric Power Sectors

The Philippine power industry is divided into three major sectors: generation, transmission, and distribution.

Under the present power industry structure, NPC generates its own electricity and buys electricity from Independent Power Producers (IPP's).

Generation used to be a monopoly of the National Power Corporation (NPC) until the issuance of Executive Order No. 215, which opened the generation sector to private investors.

At present, a number of IPP's generate and sell electricity to NPC and other customers. NPC transmits electricity to distributors and large industrial customers via high voltage wires. NPC is also responsible for constructing the transmission grid highway interconnecting the main islands nationwide.

Distribution of electricity at its usable voltage to end-consumer is performed by investor-owned utilities and numerous electric cooperatives which sell to households as well as commercial and industrial enterprises located within their franchise areas at retail rates regulated by the Energy Regulatory Board (ERB). The Department of Energy (DOE) sets policy directions for the energy industry, while the National Electrification Administration (NEA) provides financial and technical assistance to electric cooperatives.

The major reforms are embodied in RA 9136, namely the restructuring of the electricity supply industry calls for the separation of the different components of the power sector namely; generation, transmission, distribution and supply.

On the other hand, the privatization of the National Power (NPC) involves the sale of the state-owned power firm's generation and transmission assets (e.g. power plants and transmission facilities) to private investors. These two reforms are aimed at encouraging greater competition and at attracting more private sector investments in the power industry. A more competitive power industry will in turn result in lower power rates and a more efficient delivery of electricity supply to end-users.

Source: www.psalms.gov.ph

1.3.3 Main Indicators

ENERGY and PEAK DEMAND FORECAST

Electricity demand is the basic component of development planning as it integrates different electric power subsectors: distribution, transmission and generation. It also indicates the minimum required capacity and production in terms of watts (W) and watt-hour (Wh), respectively.

The energy and demand forecast for the Luzon grid is more comprehensive compared to the Visayas and Mindanao grids as it comprised about 74% of the nationwide demand vis-à-vis its contribution to the major economic structural changes, being the center of industry and commerce.

Demand Forecasting Methodology and Assumptions Following are the steps in the determination of the peak demand forecast for the major grids.

1. Determine the Energy Sales Forecast
2. Convert energy sales forecasts to peak demand forecast

Resulting Energy and Peak Demand Forecast, 2009-2030 Electricity demand growth slowed down over the years, from an average rate of 6% in Luzon, 7.6% in Visayas and 4.4% in Mindanao during the 90's to an average of 2.6% in Luzon, 6% in Visayas and 3.3% in Mindanao for the period 2000-2008. This can be attributed to factors like structural changes of the country's economy, from an industry-led to services-driven growth. In the cases of Visayas and Mindanao, the other contributing reasons are due to suppressed demand considering the tight power supply and peace and order situations, respectively, which hinder the potential for growth. Henceforth, it is assumed that the economic structure of the country remains the same. In addition, we are looking forward to greater efficiency gains in response to rising energy prices and aggressive promotion of energy conservation and energy efficiency programs for lighting system and other modes of demand-side management. By 2030, the country's energy sales are projected to increase from 55,417 GWh in 2008 to 86,809 GWh by 2018, up to 149,067 GWh by 2030. These are translated to a peak demand from 9,226 MW in 2008 to 14,311 MW by 2018 to about 24,534 MW by 2030.

TABLE 5. ELECTRICITY PRODUCTION, CONSUMPTION AND CAPACITY

	2006	2007	2008	2009	2010	2011*	Average annual growth rate (%)
Capacity of Electrical Plants (GWe)						16.16	2006-2011
- Thermal						2.99	
- Hydro						3.49	
- Nuclear						-	
- Wind						0.033	
- Geothermal						1.78	
- Coal						4.92	
- Total						2.95	
Electricity production (TWh)	56.78	59.61	60.82	61.93	67.74	69.17	
- Thermal	4.66	5.15	4.87	5.38	7.10	3.40	
- Hydro	9.94	8.56	9.84	9.79	9.81	9.70	
- Nuclear	0	0	0	0	0	0	
- Wind	0.056	0.058	0.061	0.084	0.062	0.0012	
- Geothermal	10.46	10.21	10.72	10.32	9.30	9.94	
- Coal	15.29	16.84	15.35	16.48	23.30	25.34	
- Solar/Biomass	0.0014	0.0013	0.0013	0.015	0.029	0.116	
-Natural Gas	16.37	18.79	19.50	19.89	19.52	20.59	
Total Electricity consumption (TWh)	56.78	59.51	60.82	61.93	67.74	69.17	

(1) Electricity transmission losses are not deducted.

* Latest available data

Source: Power Statistics, Department of Energy

Note: Generation data includes grid connected, embedded and off-grid generator.

TABLE 6. ENERGY RELATED RATIOS

	1980	1990	2000	2005	2007	2007
Energy consumption per capita (GJ/capita)	-	-	22.03	19.42	18.89	18.47
Electricity consumption per capita (kWh/capita)	-	-	506	583	587	590
Electricity production/Energy production (%)	-	-	19.64	22.33	22.67	22.05
Ratio of external dependency (%) (1)	-	-	51.8	44.9	43.5	40.08

Source: Energy Statistics, Department of Energy (DOE)

2.0 NUCLEAR POWER SITUATION

2.1 Historical development and current organizational structure.

2.1.1 Overview

In 1958, the Philippine Atomic Energy Commission (PAEC) was established in accordance with Republic Act 2067, which was supported by then president Carlos P. Garcia.

In 1973, the Philippine economy was under a lot of pressure due to the oil crisis. With the intention of finding an alternative energy source, President Marcos decided in July of that year to construct a nuclear power plant (NPP). Workers started building the power plant in 1976. Construction was put on hold in 1979 because of the Three Mile Island accident that happened in the United States of America (USA). A survey of the unfinished power plant showed that it had more than 4,000 defects. It was also pointed out that one of the biggest safety issues behind the BNPP's construction was that its location was prone to earthquakes. The BNPP was completed in 1984. Its construction cost the government US\$2.3 billion. With its Westinghouse pressurized water reactor, BNPP was supposed to generate 621 MW of electric energy.

In 1986, the Marcos regime ended and Aquino was installed into presidency. In April of that same year, the Chernobyl disaster happened. This was one of the major reasons; Aquino did not push through with the operation of the BNPP.

The Philippine government tried to legally charge Westinghouse Electric Company for fraudulent schemes in the installment of the Westinghouse nuclear reactor. However, a USA court turned down the case.

The succeeding administration was strained to pay off the debt incurred for BNPP's construction. They also tried to come up with ways in order to convert the NPP into a fossil fuel-based energy source, but such plans were deemed economically infeasible. In 2008, a team of surveyors led by Akira Omoto was commissioned to survey the BNPP for possible rehabilitation.

To date, Representative Kimi S. Cojuangco filed House Bill No. 1291; "an act mandating an immediate validation process which satisfies internationally accepted nuclear power industry norms to determine the Bataan Nuclear Power Plant's operability culminating in either the immediate rehabilitation, certification and commercial operation or the immediate permanent closure and salvage value recovery of the Bataan Nuclear Power Plant, appropriating funds therefore and for other

purposes “at the fifteenth (15th) Congress and is awaiting for its approval.

Source: WikiPilipinas Encyclopedia

2.1.2 CURRENT ORGANIZATION CHART

The Philippine Nuclear Research Institute (PNRI) is mandated to undertake research and development activities in the peaceful uses of nuclear energy, to institute regulations on the said uses and to carry out the enforcement of said regulations to protect the health and safety of radiation workers and the general public.

The DOE is the executive department of the Philippine government responsible for preparing, integrating, coordinating, supervising and controlling all plans, programs, projects and activities of the government relative to energy exploration, development, utilization, distribution and conservation.

The National Power Corporation (NPC or Napocor) is a state-owned company that serves as the largest provider and generator of electricity in the Philippines.

NPC started to set up the initial organization and studies for the nuclear project implementation.

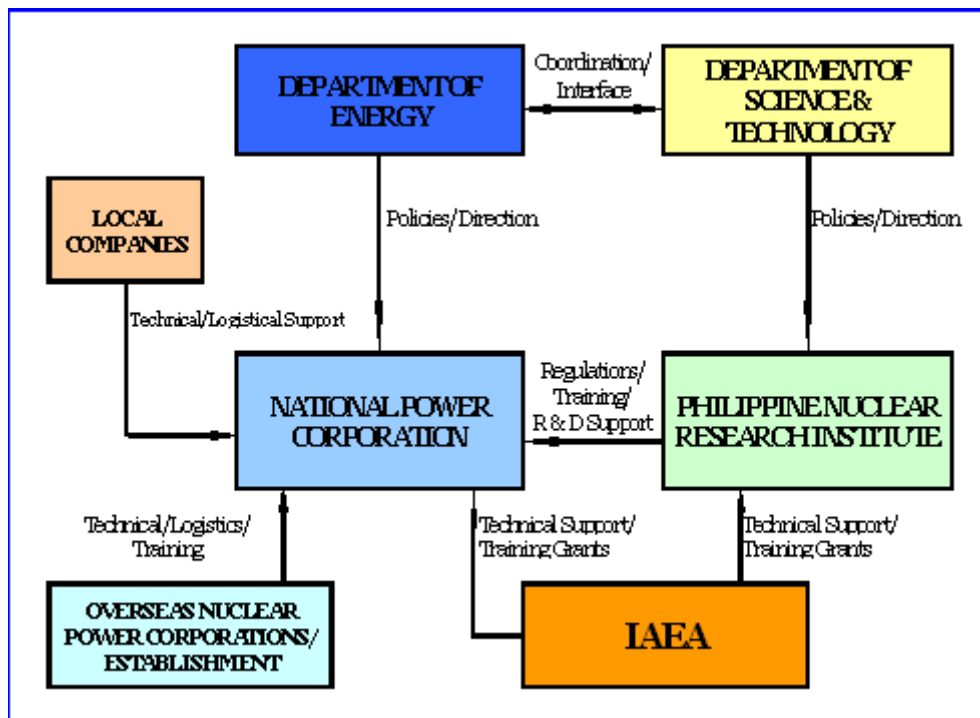


Figure3. Nuclear Organizational Chart

Source: www.pnri.gov.ph
www.doe.gov.ph
www.napocor.gov.ph

2.2 Nuclear Power Plants: Overview

2.2.1 Status and Performance of Nuclear

Table7. Status and Performance of Nuclear Power Plants

Station	Type	Net Capacity	Operator	Status	Reactor Supplier	Construction Date	Grid Date	Commercial Date	Shutdown Date	UCF for Years
BNPP	PWR	620MW	NPC	Mothballed	Westinghouse	1976-07-01	N/A	N/A	1986-05-01	N/A

Source: PRIS database (www.iaea.org/pris), BNPP, National Power Corporation

2.2.2 Plant Upgrading, Plant life management and license renewal

The BNPP is under preservation since its completion in 1986 and a preservation team from the National Power Corporation has been working to preserve the plant up to present.

Due to the need for a potentially cheap and safe power generation facility, the Philippine government is considering the rehabilitation of BNPP by virtue of House Bill No. 1291, filed at the Fifteenth (15th) Congress.

The Korea Electric Power Corporation (KEPCO) performed feasibility study on BNPP from February-April 2009.



Figure4. Bataan Nuclear Power Plant

2.3 Future Development of Nuclear Power

2.3.1 Nuclear Power Development Strategy

Since the creation of the DOE in 1992, only the PEP covering the planning period 1998-2035 incorporated nuclear as a long term energy supply option. The 1998 Plan forecast developed four scenarios to determine its sensitivity to different energy policy alternatives and impact of regional cooperation programs. Under the said

plan, a 600 MW nuclear plant will be operational by 2025. Additional nuclear plant units, 600 MW each, were planned to be completed in 2027, 2030 and 2034. Thus under the PEP 1998-2035, the total nuclear capacity was projected to reach 2,400 MW by the end of the planning period. At present, a bill for the re-commissioning of the BNPP is pending in the Philippine Congress, which when passed into law would hasten the nuclear program for the Philippines. Likewise, operation of the said power plant would also trigger the construction of more units. When the BNPP re-commissioning bill is approved, feasibility for the plant's re-commissioning will be undertaken and within a period of three to five years, BNPP may be put into operation.

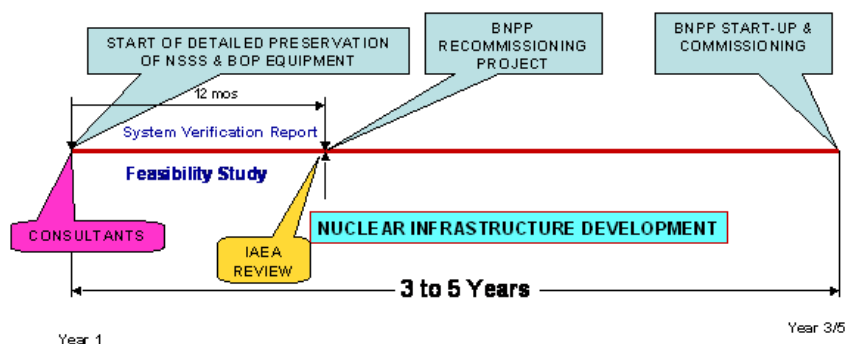


Figure 5. Nuclear Infrastructure Development

The contract for the re-commissioning of BNPP may be through a government-to-government arrangement. For the nuclear power cycle involving the BNPP, the recommendations from which the Philippine government would contract its re-commissioning project would be the prime consideration. However, for the future programs, the Philippine strategy at the moment for the back end of the cycle would be for long term storage of spent fuel onsite, while awaiting for the identification of the Philippines, National Radwaste Repository Center. A suitable site within the Philippines was already identified for this center.

Table 8. PLANNED NUCLEAR POWER PLANTS

Station/Project/Name	Type	Capacity	Expected Construction Start Year	Expected Commercial Year
BNPP	PWR	620 MW	-	-
NPP 1	PWR	600 MW	2015	2025
NPP 2	New Generation NPP	600 MW	2017	2027
NPP 3	New Generation NPP	600 MW	2020	2030
NPP 4	New Generation NPP	600 MW	2025	2035

Source: Philippine Energy Plan

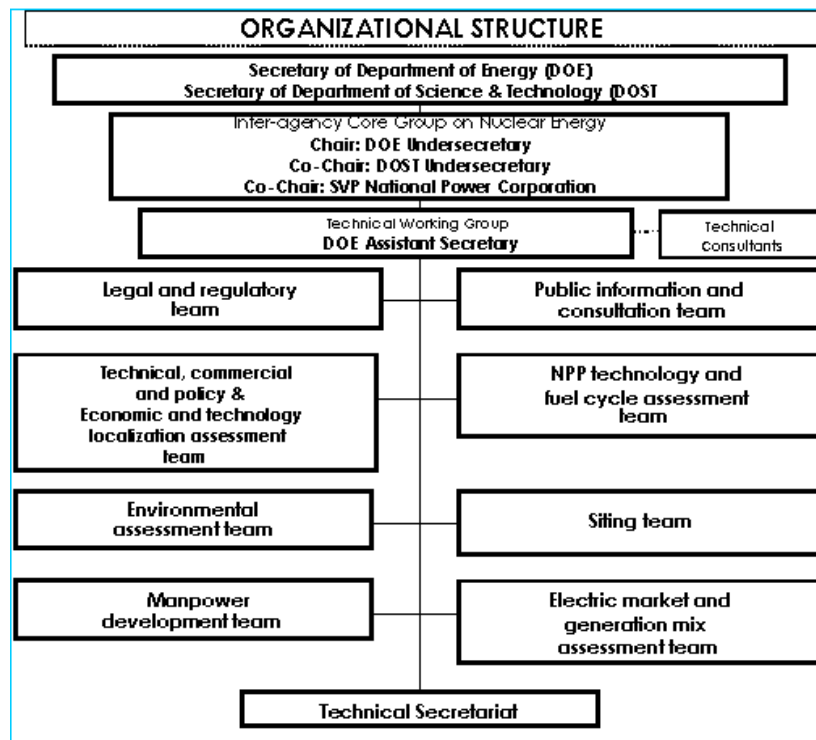


Figure 6. Organizational Structure

The development of the country's nuclear power program is vested under a governmental ad-hoc committee described in Figure 6. By virtue of an inter-departmental order between DOE and DOST, this inter-agency Core Group on nuclear energy was created. Its prime objective is the development, management, setting up of policies and strategies which will involve nuclear power generation. Part of their mandate is the feasibility study for the possible re-operation of BNPP.

2.3.3 Project Funding

The nuclear power project would be funded by an external financing organization in view of the huge capital cost necessary in putting up a new plant. Likewise, in case of the BNPP re-commissioning, external funding may also be required. However, the re-commissioning bill has made certain provisions in the electricity tariff as source of funds for BNPP.

2.3.4 Electric Grid Development

New high voltage transmission lines as well, as well as switchyard upgrade is necessary for the re-commissioning of BNPP, as well as for new power plants.

2.3.5 Site Selection

In 1998, the government created a committee, the Nuclear Power Steering

Committee, to provide for the direction on the country's nuclear power program during this period. It identified numerous possible sites throughout the country as future sites for NPPs, as shown in Figure 7.

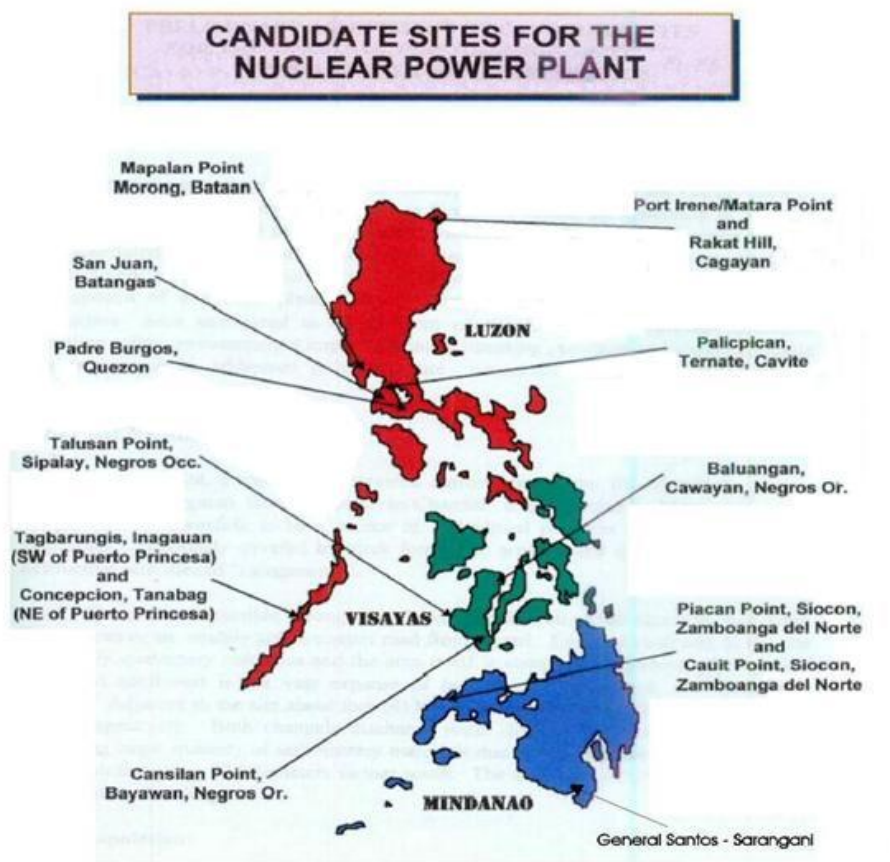


Figure 7. Other Candidate Sites for the Nuclear Power Plant

Except for the Bataan site, this would only need updating date for its Environmental Impact Assessment. All sites are located near the sea, hence the presence of abundant cooling water from the sea. Likewise, all identified sites are accessible by land transportation and within distance from transmission lines.

2.4 Organizations involved in construction of NPP's

The National Power Corporation will be the main player based on existing laws, and because of its vast experience in electric power generation and construction. It has its own engineering, technical services and project management organizations which are well equipped to handle the pre-construction activities, construction stage, operation and maintenance, and decommissioning of an NPP.

2.5 Organizations involved in operation of NPPs

The National Power Corporation will be responsible for the operation of NPPs.

2.6 Organizations involved in decommissioning of NPPs

For the decommissioning of NPPs, it will be the National Power Corporation who will implement the activity.

2.7 Fuel Cycle Including Waste Management

For the country's first operational NPP, the front end of the nuclear fuel cycle will be sourced through foreign expertise, similar to BNPP. The BNPP's fuel supply contract with Westinghouse included the mining and milling, uranium conversion and enrichment, up to fuel fabrication. The same scheme would be arranged for future new plants and BNPP, should it be put into operation.

The new technology for onsite interim storage of spent fuel would be used until a firm governmental decision is issued with regards to the future use of the spent fuel. For BNPP, if put into operation, the storage facility will be set-up.

Reprocessing is at present not among the priorities for the nuclear program, however, should there be decision on the reprocessing of spent fuel for conversion into fuel again, then it will be sent to a country where the industry is already in-place or already matured.

On the issue of waste management, the Philippine Nuclear Research Institute, through the technical and financial assistance of the IAEA, has already identified suitable sites within the Philippines as its National Radwaste Repository Center. The center is being set up for the long-term storage of high level wastes coming from hospitals, from the PNRI itself and from NPPs in the future.

2.8 Research and Development

2.8.1 R & D Organization

At present, the PNRI has the mandate on R&D in the field of nuclear sciences and technology. The country does not have any private institution that deals in this field. However, the pending bill in Congress on the reactivation of BNP has included provisions for the nuclear R&D. Also, upon embarking to nuclear power, the country's science and technology industry will certainly add R&D on nuclear.

2.8.2 Development of advance nuclear technologies presently

The country is not engaged in any advanced nuclear technology development.

2.8.3 International Co-operation and Initiatives

On an international level, the PNRI acts as the national government agency which represents the country as a member state in the IAEA. PNRI has cooperative agreements in nuclear technology with other 16 members states of the Regional Cooperative Agreement (RCA) for

research, development and training related to nuclear sciences and technology for Asia and the Pacific. The PNRI partners with several organizations and entities like the RCA Regional Office (RCARO), Forum for Nuclear Cooperation in Asia (FNCA), Comprehensive Nuclear Test Ban Treaty Organization (CTBTO) and other organizations from Australia, Canada, Japan, Korea, United States and other countries through bilateral agreements/institute to institute agreements.

2.9 Human Resources Development

The present government is putting a premium on human resource capability building and enhancement as a necessary prelude in considering nuclear power as a long term energy option. Capability building and enhancement on the various aspects on nuclear energy will involve training local manpower for the possible introduction of nuclear power into the country's energy system.

Currently, the DOE, as the focal governmental institution on the nuclear power program, is leading an inter-agency discussion among the concerned governmental organizations, the academy and private sector to flesh out the responsibilities of re-building local technical capability in nuclear sciences and engineering. Due to retirement of many engineers, new manpower will be recruited and developed.

2.10 Stakeholder Communication

A Communication Program titled BNPP Communication Plan, to be implemented by the NPC's Corporate Communications, is on the drawing board with the following objectives:

- a. Raise level of awareness among concerned public on the benefits of nuclear power in general and revival of the BNPP in particular.
- b. Address the issues being raised by anti-nuclear and anti-BNPP parties through various forms.
- c. Create an environment positive for the acceptance of the revival of BNPP, as a possible option in addressing the lack of generation capacity.

The target audiences are the general public, media, decision-makers and stake holders, like the Philippine Congress, local government units (LGUs), churches, local media, non-governmental organizations and the private sector.

Communication approaches will be through the tri-media (TV, print and radio) approach of press releases, features stories and interviews, and guest/personal appearances to relevant talk shows. The other approach is inter-personal approaches, like the hosting of public forum and symposia with students from major academic institutions and LGUs within the vicinity of BNPP, and will include sponsorship tours to the plant site. The media to be used will be the major broadsheets and magazines, leaflets, posters and flyers, comic book and fire-minute feature stories and visual productions on TV.

3. NATIONAL LAWS AND REGULATIONS

3.1 Regulatory Framework

3.1.1 Regulatory Authority

The present nuclear regulatory authority is the PNRI, formerly the Philippine Atomic Energy Commission or PAEC. The PNRI's basis for nuclear power plant regulation is the USNRC Code of Federal Regulations (CFR).

3.1.2 Licensing Process

The licensing procedures involve three main processes; the Provisional Permit stage where a licensee is issued with Provisional Permit or limited Work Authority.

Next is the Construction Permit Stage where a construction permit is issued upon licensee's satisfaction or compliance to various requirements of the Preliminary Safety Analysis Report (PSAR).

The third stage is the Operating license stage, where after completion of all conditions present; regulatory requirements, licensing of operators, etc., an Operating license is issued, where the licensee can then proceed with the fuel core loading and initiate reactor operation for criticality.

3.2 Main National Laws and Regulations in Nuclear Power

- Republic Act no. 2067 (Science Act of 1958) created the Philippine Atomic Energy Commission (PAEC). At the initiative of PAEC the Congress enacted RA 3859 amending RA 2067. To provide PAEC with a dual mandate to promote the peaceful applications of atomic energy and to license and regulate the use of radioactive materials.
- Republic Act No. 5207 (Atomic Energy Regulatory and Liability Act of 1968) was enacted by Congress to establish the comprehensive nuclear regulatory function of PAEC. Provided authority to PAEC to issue licenses for the construction, possession and operation of any atomic energy facility. It also served as basis for the promulgation of rules and procedures in the licensing of nuclear power plants.
- RA No. 6395 enacted in 1971 – authorized the National Power Corporation (NPC) to established and operate NPPs.
- Presidential Decree No. 606 issued on December 13, 1974 constituted PAEC as an independent and autonomous body, transferring the same from the National Science Development Board (NSDB) to the Office of the President (OP).

- With the creation of the Ministry of Energy (MOE) under Presidential Decree No. 1206 dated October 06, 1977, PAEC was transferred to the control and supervision of the MOE from the Office of the President.
- Executive Order No. 613 dated August 15, 1980 transferred PAEC from MOE back to the office of the President.
- 1981- Code of PAEC Regulations (CPR) promulgated in April 1981 under Administrative Order No. 1 Series of 1981. The National Standards/Regulatory Requirement were as follows:
 - CPR Part 3, “Standards for Protection Against Radiation”
 - CPR Part 4, “Rules and Regulations on the Safe Transport of Radioactive Material”
 - CPR Part 7, “Licensing of Atomic Energy Facilities”, based mainly on US NRC documents and IAEA Standards, codes and guidelines.
- Executive Order No 708 which was promulgated on July 27, 1981 attached PAEC to the Office of the Prime Minister
- On March 17, 1984, Executive Order No. 784 reorganized NSDB to National Science and Technology (NSTA) and placed PAEC under its administrative supervision. Executive Order no. 980 dated August 29, 1984 converted PAEC from a single-headed agency into a multi-headed agency composed of a Chairman and four (4) Associate Commissioners forming the Board of Commissioners. It reaffirmed PAEC’s role as the nuclear regulatory board.
- In Executive Order No. 128 dated January 30, 1987, the NSTA was reorganized to the Department of Science and Technology (DOST) and PAEC became the Philippine Nuclear Research Institute (PNRI) headed by a Director and assisted by a Deputy Director.
- House Bill No. 6300 An Act Mandating the Immediate Rehabilitation, Commissioning and Commercial Operation of the Bataan Nuclear Power Plant, Appropriating Funds therefore, and for other Purposes (2009)
- House Bill Nos. 3155 and 3254, An Act to Regulate the Nuclear, Security and Safety Aspects in the Peaceful Utilization of Radiation Sources through the Creation of the Philippine Nuclear Regulatory Commission Appropriating Funds, therefore, and for other purposes (2009)
- House Bill No. 1291, An Act Mandating an Immediate Validation Process which satisfies Internationally Accepted. Nuclear Power Industry Norms to Determine the Bataan Nuclear Power Plant’s Operability Culminating In Either The Immediate Rehabilitation, Certification And Commercial Operation Or, The Immediate Permanent Closure And Salvage Value Recovery, of the Bataan Nuclear Power Plant, Appropriating Funds Therefore, And For Other Purposes (July, 2010).

REFERENCES:

1. Philippine Energy Plan 2007-2014, “Fueling Philippine Development through Greater Access to Energy”, DOE
2. Highlights of the 2009-2030 Philippine Energy Plan, DOE.
3. PNRI @ 50, “ Making Science and Technology Work for You,” PNRI 2008
4. PNRI Nuclear Research Institute Annual Report 2007
5. Philippine Nuclear Power Plant Unit 1, General Information and Technical Features, National Power Corporation, Engineering Division, February 1984.

APPENDIX 1: International, Multilateral and Bilateral Agreements

International Treaties, Conventions and Agreements Signed/Ratified

- The Convention on Nuclear Safety
- The Joint Convention on Safety of Spent Fuel Management and on the Safety of Radioactive Wastes
- The Joint Protocol Relating to the Application of the Vienna and Paris Convention
- The Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage.
- Convention on Supplementary Compensation for Nuclear Damage
- The Protocol Additional to the NPT Safeguards Agreement
- A Party to the Southeast Asia Nuclear Weapons Free Zone Treaty.

Cooperation Agreements with IAEA in Area of NP

- Human Resources Development and Nuclear Technology

Support, 2003-2008

- Development of a Near-Surface Radioactive Waste Disposal Facility, 2007-2008

Bilateral Agreements with other Countries or Organizations Signed/Ratified by the Country in the Field of Nuclear Power.

- Memorandum of Understanding for Cooperation on the Nuclear Power Project in the Philippines between NPC and KEPCO.

APPENDIX 2: Main Organizations, Institutions and Companies Involved in Nuclear Power Related Activities.

- | | | |
|-----------|---|---|
| 1. Name | : | National Power Corporation (NPC) |
| Address | : | National Power Corporation
Quezon Avenue Corner BIR Road, Diliman
1100 Quezon City, Philippines |
| Telephone | : | +63 2 9213541 to 79 |
| Facsimile | : | +63 2 9212468 |
| Email | : | mlmarcelo@napocor.gov.ph |
| URL | : | http://www.napocor.gov.ph |

- Activity : Government Electric Utility Company
2. Name : Department of Energy (DOE)
 Address : Energy Complex, Meritt Road Fort Bonifacio
 Taguig City, Philippines
 Telephone : +63 2 840 - 2008
 +63 2 840 - 2134
 Facsimile : +63 2 812- 6194
 Email : sec@doe.gov.ph
 URL : <http://www.doe.gov.ph>
 Activity : Governmental Agency for Energy Policies
3. Name : Philippine Nuclear Research Institute (PNRI)
 Address : Commonwealth Avenue, Diliman
 1100, Quezon City, Philippines
 Telephone : +63 2 9296010 to 19
 Facsimile : +63 2 9201646
 URL : <http://www.pnri.dost.gov.ph>
 Activity : Governmental Institution for Beneficial use of nuclear
 Science and technology, including regulations,
 safeguards, licensing and control of nuclear utilities and
 materials.

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