

Country Report on Small Hydro Power (SHP)

NOEL R. ESTOPEREZ
Philippines

Brief Introduction

Population (2001E): 82.8 million

Location/Size: Southeast Asia/115,830 sq. mi. (slightly larger than Arizona)

Major Cities: Manila (capital), Quezon City, Cebu, Davao

Languages: Pilipino (official; based on Tagalog), English (official)

Ethnic Groups: Christian Malay (91.5%), Muslim Malay (4%), Chinese (1.5%), other (3%)

Religions: Roman Catholic (83%), Protestant (9%), Muslim (5%), Buddhist and other (3%)

Proven Oil Reserves (1/1/02E): 178 million barrels (Oil and Gas Report)

Oil Production (2001E): 8,460 bbl/d

Oil Consumption (2001E): 356,000 bbl/d

Net Oil Imports (2001E): 347,540 bbl/d

Crude Oil Refining Capacity (1/01/02E): 419,500 bbl/d

Natural Gas Reserves (1/1/02E): 3.693 trillion cubic feet

Natural Gas Production and Consumption: (2000E) Negligible

Recoverable Coal Reserves (2000E): 366 million short tons

Coal Production (2000E): 1.49 million short tons

Coal Consumption (2000E): 9.5 million short tons

Electric Generation Capacity (1999E): 12 million kilowatts , 13,459 MW

(2002)Electricity Generation (2000E): 40.7 billion kilowatthours (bkwh) (57.5%

thermal, 19.9% hydro, and 22.6% "renewables"*) Electricity Consumption (2000E):
37.8 bkwh
Brief History

Hydropower development in the Philippines started in 1913 with the first power plant established by missionaries in Baguio City, the Camp John Hay Hydroelectric Power Plant with an installed capacity of 560 kilowatts. The private sector continued the development of water resources for power generation until Commonwealth Act No. 120 created the National Power Corporation (NPC) in 1936. The law nationalized the hydroelectric power industry and reserved for the use of NPC all streams, lakes, and rivers in the country where power may be developed, subject to existing rights. In 1979, Presidential Decree 1645 mandated the National Electrification Administration (NEA) to develop the country's small-scale hydropower potentials (mini-hydro).

With the expected increase in power demand and the large amount of investment requirements for power generation, the Philippine Government offered the private sector the opportunity to earn rates of return which are competitive with the returns from similar business activities. In 1987, executive order No. 215 was approved allowing private sector participation in power generation activities. Republic Act No. 6957 or the BOT/BT Law was passed in 1990 to complement E.O. 215 authorizing the financing, construction, operation and maintenance of infrastructure projects by the private sector. This was later amended by Republic Act No. 7718 (BOT, BOO, BT Law) in 1994. These laws paved the way for NPC to offer specific hydropower projects with capacities ranging from 5 MW to 50 MW to the private sector under a BOT scheme.

To further boost private sector participation in hydroelectric power generation, the government enacted Republic Act No. 7156 in 1991, otherwise known as the Mini-Hydroelectric Power Incentives Act.

Last year, the Electric Power Industry Reform Act 2001 also known as R.A. 9136 was passed which mandates the privatization of National Power

Corporation (NPC).

Two major reforms are embodied in RA 9136, namely, the restructuring of the electricity supply industry and the privatization of the National Power Corporation (NPC). The restructuring of the electricity 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 Corporation (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.

The Electric Power Industry

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 IPPs. Generation used to be a monopoly of the NPC until the issuance of Executive Order No. 215, which opened the generation sector to private investors. At present, a number of IPPs 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 electric utilities, notably the Manila Electric Company (Meralco), a few local government-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).

Power Infrastructure Development

To meet the increase in electricity demand of 5.1 percent, an additional capacity of 217 MW was installed during the year, bringing the country's total installed capacity to 13,459 MW. This includes the 140 MW Casecanan, 70 MW Bakun and 7 MW Bubunawan hydroelectric power plants installed during the period.

On the other hand, the 22 MW Bohol Diesel power plant was retired during the year. A total of 2,304 MW of aging oil-based power plants that have outlived their useful economic life was retired since 1995.

With the government's desire to decrease dependence on imported oil, the country's power generation mix for 2001 is dominated by coal at 41.3 percent followed by geothermal steam (21.6 percent), oil (21.0 percent), hydro (15.9 percent) and natural gas (0.2 percent). This is a significant shift from the historical generation mix of the country which was predominantly oil.

Hydro Power Development

The country's policy of reducing its dependence on imported fuels has given attention to the development of its indigenous energy resources. The abundance of water resources in the country makes hydropower energy an important sector on energy planning.

Hydro Potentials

A total of 14,367 MW of hydro power potentials has been identified in 293 sites throughout the country.

In the main island of Luzon, 8,874 MW out of 10, 100 MW of hydro potentials remain to be developed in the future. For the Visayas, around 638 MW of untapped hydroelectric power resources were identified while in Mindanao, 2,641 MW can still be harnessed. On a countryside basis, around 12, 153 MW of hydro capacity or about 84% of the total potential capacity, offer an opportunity for future development. [PEP 1992]

Hydro Conditions in the Philippines: A Situationer Luzon Grid

Hydroelectric plants operating in Luzon are a mix of small run-of-river and mid-size pondage type dams. The biggest of the hydro units is the 360- MW Magat hydro plant . Hydro played a major role in power generation in the Luzon Grid . It contributed to the grid an average energy of 2,871 GWH or about 20% of the total grid electricity production.

Visayas Grid

The two hydroelectric power plants in the Visayas are relatively small and old, considering that they were operational in the fifties and sixties. The 1.2 MW Loboc hydro in Bohol was commissioned in 1957 while the 0.8 MW Amlan hydro in Negros was put on-stream in 1962.

Mindanao Grid

For the past twelve years, 1980- 1991, the average yearly inflow to Lake Lanao was recorded at 85 cms. From 98 cms recorded in 1980, the inflows exhibited erratic movements throughout the years until a continuous decline in the last three years was observed. In 1991, the average inflow was measured at only 61 cms or 28% below the average level.

The same thing was observed in the Pulangi average annual inflows. The average inflow for the period was measured at 127 cms. In 1991, the inflow reached only 91 cms.

The alarming deteriorating inflows from Lake Lanao and Pulangi River could be attributed to the El Niño phenomenon and the forest denudation brought about by the rampant illegal logging activities around Lake Lanao and Pulangi areas.

Small-Hydro in Philippines

Small and mini-hydro projects have the potential to provide energy in isolated villages and hilly areas where extension of grid systems is uneconomical. Recognizing this fact, Philippine government encourage the development of establishing mini-hydropower plants in the country through its "Olaw" rural electrification program which stipulates 100% electrification by 2004 and the Republic Act 7156, an act granting incentives to mini-hydroelectric power developers. The total identified mini-hydropower resource potential is about 1132.5 MW.

Status of Mini-hydro Power (MHP) in the Philippines (100 kW < MHP < 10 MW)

There are fourteen mini-hydroelectric power operating contracts awarded by the DOE with a combined generating capacity of 45.66 MW. Twelve of the contract belong to Hydro Electric Development Corporation (HEDCOR) and its sister company, the Northern Mini Hydro Corporation (NMHC). HEDCOR operates eleven mini-hydro plants, while NMHC operates three. These two companies were the initial beneficiaries of RA 7156 when their facilities were registered in 1992 and 1993, to avail of incentives under the law. Twelve of these plants were already existing while two of the plants were under construction at the time of the passage of the law. Some of these plants namely, Ampohaw, Bineng 1, Bineng 2, and Bineng 3 have been upgraded to increase generating capacities.

The other two contracts belong to Bicol Hydropower Corporation (BHC) and Bubunawan Power Co., Inc. (BPC). The 960 kW Inarihan MHP of BHC was commissioned on 23 February 1998, while the 7 MW Bubunawan Falls MHP of BPC is targeted for completion and commissioning by early 1999.

Per DOE records, the total installed capacity of fifty-one (51) existing mini-hydro facilities all over the country is 81.12 MW representing 3.52% of the total installed hydropower capacity of 2304.64 MW. These mini-hydro plants are either administered by NPC, NEA, NIA, DOE and privately owned. However, seven of these mini-hydro plants are inoperational due to a number of reasons (siltation, structural, damage caused by a 1990 earthquake, no flow etc.). the average annual power generated by these mini-hydro plants is around 200 gigawatt-hours (GWh) contributing an equivalent of 0.34 million barrels of fuel oil equivalent (MMBFOE) to the country's energy mix.

FUTURE PLAN: Iligan City (City of Waterfalls)

Topography and Vegetation

Iligan City's topography and vegetation is characterized by a narrow coastal alluvial plain fronting Iligan Bay at the footslopes of undulating hills and mountains. Several river valleys are found in the city with relatively steep slopes. At the mouth of Agus river, very steep slopes separate the coastline and the highland areas. The city is blessed with more than 20 waterfalls. The city land area has 12% of elevations lower than 100 meters above mean sea level while the remaining areas of more than 65% are with elevations of 300 meters above. More than half of Iligan' land area, or about 63% have slopes of over 30%. The predominant vegetative cover consists of coconut groves and banana plantations, which are found in plateaus and other lowlands as well as in slopes and highlands. Heavy tropical forests are found in slopes of 30% and greater and these are mostly located inland. A few swampy areas covered with marsh grass are within the barangays of Del Carmen and Bagong Silang. Some fruit trees such as mango, durian, jackfruit and tropical hardwood like lauan, molave, apitong, etc., are scattered in cultivated areas in the hinterland barangays.

Climate and Hydrology

Rainfall is evenly distributed throughout the year, averaging 139.79 mm per month for the past twenty years. Records for the past two (2) years (1998-1999) show a monthly average of 177.02 mm and 302.08 mm at 13.50 and 20.67 days, respectively.

Climate is Type C, characterized by a short dry period of one to three months. Heavy rains usually occur in the months of January, February, June, September and December. Lowest rainfall recorded is in the month of April. Annual temperature is 27.4oC.

Future Plan

In the future it is envision that a pilot mini-hydropower plant will be constructed in the city with the strong linkage with the government, power utility, academic institution and non-government organization.

Possible Area of Cooperation

- Economic Cooperation
- Financial Cooperation
- Research and Developments

Concluding Remarks

I would like to express my deepest appreciation and gratefulness to the HRC staffs, lecturers for their sincere efforts and shared knowledge.

My stay in Hangzhou,China is indeed a blessing. It deepens my understanding of my profession. The knowledge I gained, the good accomodation, the hospitality of all the people I met here in China and the friendship are extra blessings.

These are seeds that will be implanted in me and I will nourish them so it will bear fruits.

And for all participants, I hope we have the same feelings. We should be one in these endeavors not only for a cleaner and greener environment to live but also a unified world where we share and understand each other amidst our diversities. And I think, this is the essence of SHP development.

Thank you very much.