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## Chapter1 Executive Summary

The Philippine Congress enacted on June 8, 2001 Republic Act 9136, otherwise known as the Electric Power Industry Reform Act (EPIRA), which paved the way for the restructuring of the Philippine electric power industry.

Among others, EPIRA mandated the restructuring of the power sector, the break up and privatization of NPC, and the reorganization of the government agencies involved in the power sector—the Department of Energy (DOE); the National Electrification Administration (NEA); and the Energy Regulatory Board (ERB), which was abolished and renamed the Energy Regulatory Commission (ERC).

These agencies (in addition to their pre-EPIRA mandates) were clothed with additional powers, functions, and responsibilities to make them more responsive to a deregulated and liberalized power sector. In addition, some of NPC's functions—such as formulating & preparing the Power Development Plan (PDP), for instance—were transferred to DOE.

To enhance its expertise and technical skills particularly in the formulation & preparation of the PDP, DOE requested assistance from the Japan International Cooperation Agency (JICA).

After conducting a baseline study in September 2001, JICA—in cooperation with Japanese Ministry of Energy & Trade and Industry— in January 2002 confirmed the necessity of a study to improve and upgrade the planning and organizational capability of DOE's personnel.

Divided into 7 chapters, this report is a result of the study conducted by the Chubu Electric Power Co., Inc. and Mitsubishi Research Institute, Inc. for JICA. The report outlines the findings and recommendations of the study team, following its consultations with various stakeholders in the Philippine power industry.

## 1.1 Outline of the Study

The passage of the Electric Power Industry Reform Act (EPIRA) in 2001 overhauled the Philippine electric power industry. EPIRA paved the way for the restructuring of the power sector by dividing it into four distinct sectors: generation, transmission, distribution, and supply to encourage competition and the promotion of efficiency & quality of service. The law also mandated the privatization of the state-owned National Power Corp. (NPC).

The successful implementation of these reforms would largely depend on how the organizations involved in this sector would carry out the roles EPIRA prescribed to each. In particular, the further strengthening of the Department of Energy (DOE), which will oversee the implementation of the EPIRA, will be crucial.

The Japan International Cooperation Agency (JICA) offered to give its technical support to help the DOE undertake its new roles. This study identified four specific areas the DOE would require assistance in:

1) Assistance in preparing the power development program (PDP), including coordination with related subordinate programs;
2) Assistance in preparing the Missionary Electrification Development Plan (MEDP);
3) Assistance in evaluating and approving the Transmission Development Plan (TDP) prepared by the transmission company (TRANSCO); and
4) Support for establishing the DOE's Energy Investment Promotion Office (EIPO).

## 1.2 Policy Framework in the Electric Power Sector

This study looked into the policies and the structure of the electricity industry prior and upon the passage of the EPIRA to understand the new functions of the different players under a restructured sector.

**Electric Power Price in the Philippines**

At present, electricity prices in the Philippines are among the highest in Asia. But this was the case until the late 80s. The rapid increase in power costs stemmed from the power crisis in the late 80s to the early 90s. The construction of relatively high-cost power plants in a very limited period saved the Philippines from further plunging in the dark. But while this solved the power supply problem, it pushed prices of electricity upwards.

## Status of the Implementation of the EPIRA

More than two years have passed since EPIRA became effective. Implementing some of the law's mandates, however, are still in the planning stages. In particular, the Philippine government has yet to sell the National Transmission Corp. (TRANSCO) despite the two public biddings already conducted. Instead, the PSALM has decided to proceed with the sale of NPC generating assets, veering away from its original plan to privatize the generating assets only after the sale of the transmission facilities. The establishment of the wholesale electricity spot market (WESM) has also encountered difficulties with the approval of funding assistance, consequently delaying the start of its operations. WESM's establishment and operation is seen to bolster competition in the generation sector and in the long-term eventually bring down prices.

With the enactment of the EPIRA, supply expansion will now be left to the market since NPC will be privatized. The law specifically stated that the government through NPC can only pursue new power projects during times of imminent shortage of supply. Yet despite a robust demand growth, the Philippine energy sector is facing problems of how to encourage prospective bidders to construct additional generating capacity and to expand the necessary transmission lines.

## Respective Roles of ERC and DOE

As a policy formulating and implementing agency that will oversee the new power industry, the DOE has undertaken structural and organizational reforms to respond to the challenges of meeting its expanded functions.

A new bureau—the Electric Power Industry Management Bureau (EPIMB)—was created, primarily tasked to push for the electric power reforms as well as to manage the electric power industry. But while the bureau is saddled with huge volume of work, the staffing pattern has yet to be completed. The new functions of the bureau, specifically the formulation of the Power Development Plan (PDP), Transmission Development Plan, and the Missionary Electrification Plan (MEDP), also require technical assistance and skills development on the part of its employees.

The ERC, meanwhile, is the regulatory body that will oversee the implementation of the law. For instance, the ERC, as the approving body, plays a major role in the implementation of

power projects stated in the PDP, TDP and MEDP to meet the growing demand in electricity.

**Donor Activity**

The energy sector is one of the many sectors that have received technical and funding assistance by multinational donor agencies. But of the total 211 grant projects (NEDA as of December 2002), only 16 projects were channeled to this sector, in particular to the DOE. Most of the technical assistance awarded to the DOE are related to the EPIRA implementation. This study is the only form of assistance related to the formulation of the PDP.

**Proposal for Electric Power Policy**

The passage of the TRANSCO franchise bill, which will give the would-be owner the authority to operate the transmission system and to build and rehabilitate lines, is one of the key elements in the marketability of the TRANSCO assets. The delays of the passage of the bill, however, have negatively affected the TRANSCO privatization. To address the concerns of potential bidders for TRANSCO, the Power Sector Assets and Liabilities Management Corp. (PSALM), mandated to execute the sale of NPC's transmission and generating assets, should clarify the conditions of congressional approval on franchise transfer to the concessionaire on one hand, and the obligations of the concessionaire, on the other.

While the privatization of TRANSCO is still pending, PSALM should proceed with the sale of NPC generating assets to meet the mandate of the EPIRA by completing the sale of 70% of NPC assets within three years from its effectivity.

Since the government does not provide any form of guarantee, selling some of the plants especially aging power facilities may be difficult except for the competitive base load plants. If asset sales are assumed to be the first priority, the government should give some form of partial guarantee. An investment recovery scheme should also be formulated for plants that are less attractive to investors.

## 1.3 Electric Power Demand Forecasting

This study examines how electricity demand forecasting in the Philippines, as well as the factors affecting demand forecasts, and provides an overview of how demand forecasting is conducted in countries with more advanced deregulated power sectors. It likewise introduces a new forecasting scheme, and illustrates the step-by-step procedure for this scheme. The study likewise proposes ways on how the DOE could improve its existing demand forecasting methods.

**Economic Growth and Electric Power Demand Indicators in the Philippines**

According to the NSO, the Philippine population has already reached a little over 75 million in 2000. Population data from 1975-2000 shows that the country's population grows by 2% annually.

On the other hand, an annual GDP growth rate of 3%-4% has been maintained, reversing negative growth recorded during the Asian Financial Crisis.

Examination of the Philippines' electricity demand patterns—which are driven by these factors—was conducted, considering that the non-industrial sector accounts for the majority of the total energy sales.

**Demand Forecasting Models**

In the past, NPC utilized a regression formulation in its demand forecasting, taking into consideration a logarithm of external variables and target variables.

In this study, the JICA team simulated demand forecasting using multiple regression analysis with population and GDP data per capita for the residential sector, and a single regression analysis with GDP data for the non-residential sector. Under this new scheme, demand forecasting was conducted by region, based on sales data in the distribution system.

**Forecast Results**

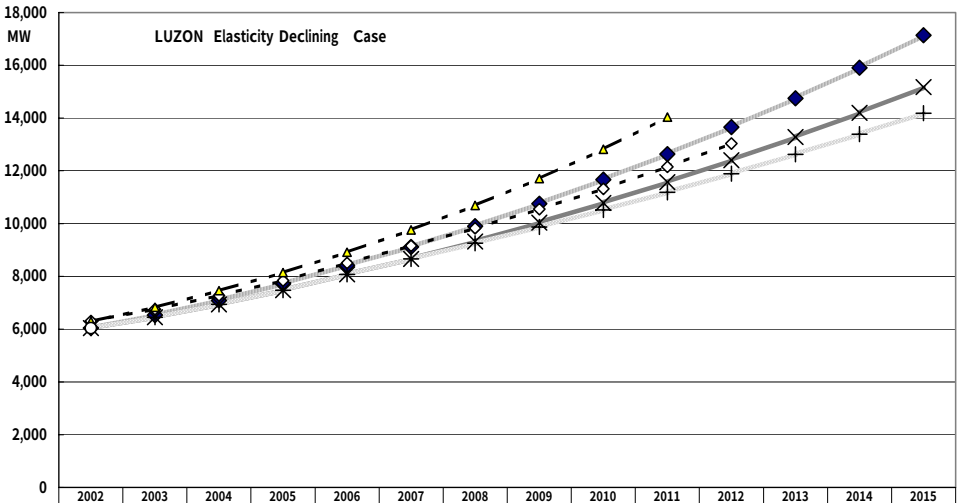
Demand forecasting results using the new forecasting model show that in Luzon, three result curves are close to the PDP 2003-2012 results, assuming a declining elasticity. Only in the case of high GDP becomes higher than the curve in PDP 2003-2012. If there is constant

elasticity, there are three results between the curve in PDP 2002-2011 and in PDP 2003-2012.

Forecast results for the Visayas indicate that the growth curve is very similar to the results of PDP 2003-2012, assuming that there is a declining elasticity. On the other hand, if elasticity remains constant, all three curves are between the curve in PDP 2002-2011 and PDP 2003-2012.

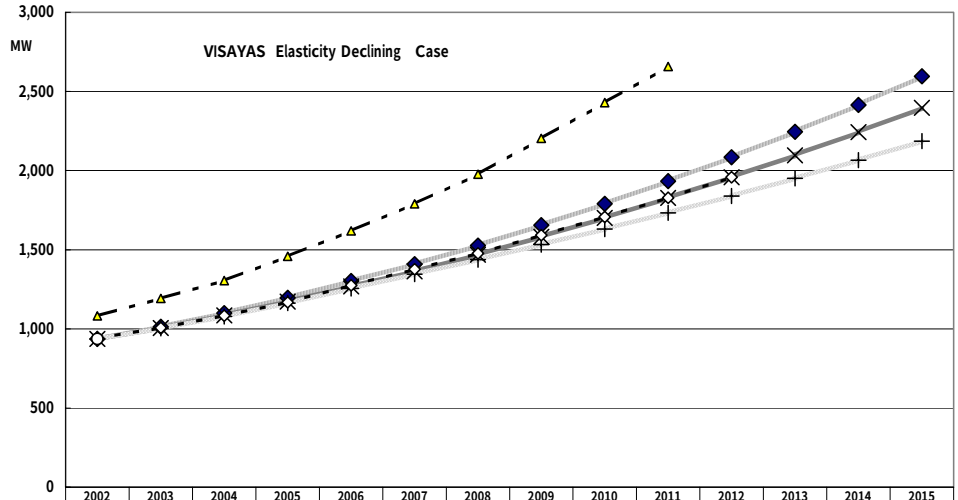
For Mindanao, forecast results indicate that the curves are below the PDP 2003-2012 when the elasticity is on the decline. In the case of a constant elasticity, low GDP has almost the same curve as the PDP 2003-2012 results.

**Fig.1.1 Demand growth curve in Luzon (declining elasticity)**



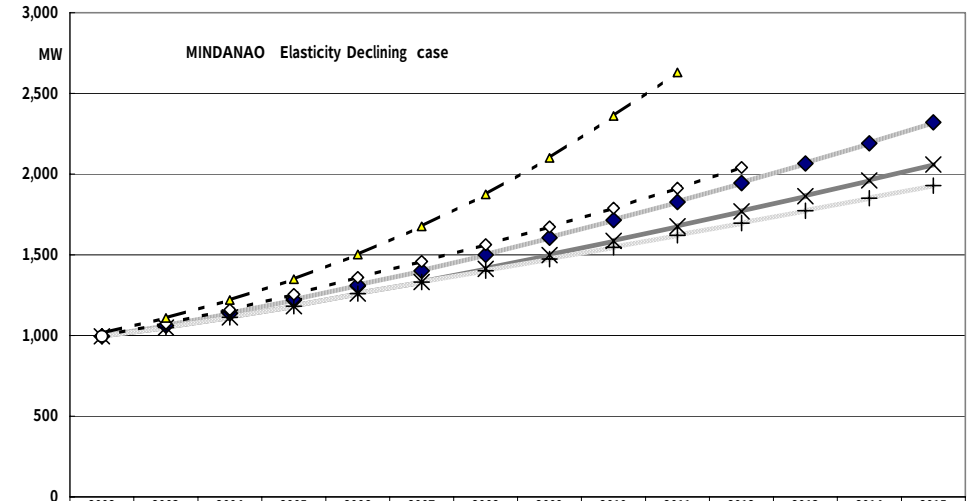

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEDA High GDP CASE Luzon | 6,039 | 6,530 | 7,090 | 7,718 | 8,416 | 9,115 | 9,903 | 10,759 | 11,667 | 12,632 | 13,657 | 14,746 | 15,905 | 17,137 |
| NEDA LOW GDP CASE Luzon | 6,039 | 6,454 | 6,937 | 7,473 | 8,076 | 8,662 | 9,323 | 10,036 | 10,786 | 11,575 | 12,406 | 13,280 | 14,201 | 15,171 |
| LOWER GDP Modified CASE Luzon | 6,039 | 6,454 | 6,937 | 7,473 | 8,076 | 8,662 | 9,255 | 9,872 | 10,517 | 11,189 | 11,890 | 12,622 | 13,387 | 14,186 |
| PEP2003-2012 LOW GDP Case Result Luzon | 6,308 | 6,752 | 7,275 | 7,835 | 8,503 | 9,161 | 9,830 | 10,548 | 11,319 | 12,149 | 13,034 | | | |
| PEP2002-2011 LOW GDP Case Result | 6,293 | 6,830 | 7,458 | 8,143 | 8,915 | 9,762 | 10,689 | 11,705 | 12,816 | 14,038 | | | | |
| Luzon Actual | 6,039 | | | | | | | | | | | | | |

**Fig. 1.2 Demand growth curve in the Visayas (declining elasticity)**



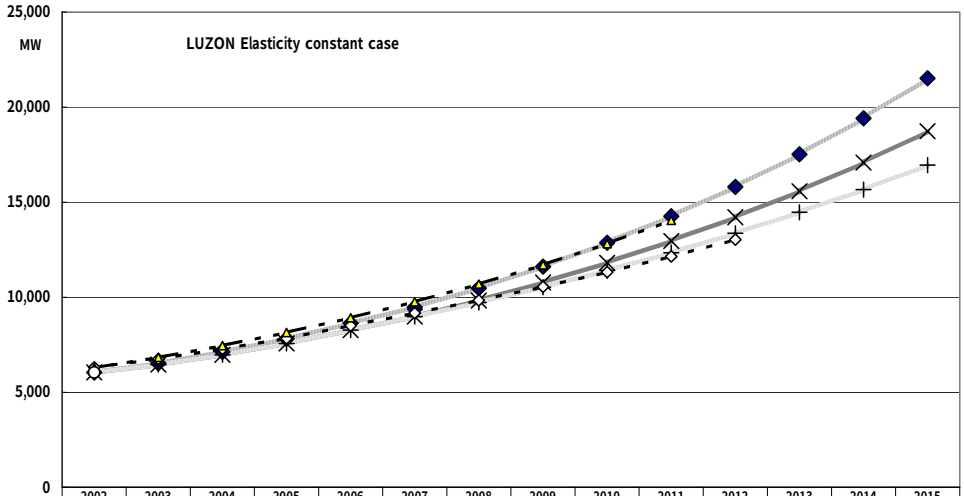

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEDA High GDP CASE Visayas | 936 | 1,013 | 1,100 | 1,197 | 1,302 | 1,409 | 1,527 | 1,655 | 1,790 | 1,933 | 2,085 | 2,245 | 2,415 | 2,596 |
| NEDA LOW GDP CASE Visayas | 936 | 1,006 | 1,085 | 1,172 | 1,269 | 1,363 | 1,469 | 1,582 | 1,702 | 1,827 | 1,959 | 2,097 | 2,243 | 2,397 |
| LOWER GDP Modified CASE Visayas | 936 | 1,003 | 1,079 | 1,163 | 1,256 | 1,346 | 1,438 | 1,532 | 1,631 | 1,733 | 1,840 | 1,950 | 2,066 | 2,186 |
| PEP2003-2012 LOW GDP Case Result Visayas | 941 | 1,007 | 1,084 | 1,168 | 1,276 | 1,377 | 1,477 | 1,592 | 1,707 | 1,829 | 1,958 | | | |
| PEP2002-2011 LOW GDP Case Result | 1,082 | 1,192 | 1,305 | 1,459 | 1,619 | 1,790 | 1,977 | 2,203 | 2,430 | 2,657 | | | | |
| Visayas Actual | 936 | | | | | | | | | | | | | |

**Fig. 1.3 Demand growth curve in Mindanao (declining elasticity)**



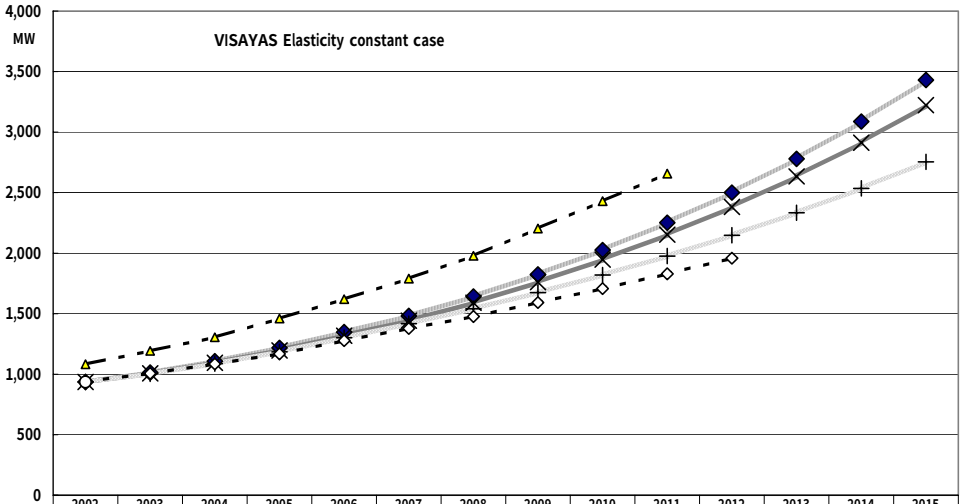

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEDA High GDP CASE Mindanao | 995 | 1,061 | 1,136 | 1,220 | 1,312 | 1,401 | 1,500 | 1,605 | 1,715 | 1,828 | 1,945 | 2,066 | 2,192 | 2,321 |
| NEDA LOW GDP CASE Mindanao | 995 | 1,049 | 1,112 | 1,181 | 1,259 | 1,331 | 1,412 | 1,498 | 1,586 | 1,676 | 1,769 | 1,864 | 1,960 | 2,060 |
| LOWER GDP Modified CASE Mindanao | 995 | 1,049 | 1,112 | 1,181 | 1,259 | 1,331 | 1,402 | 1,474 | 1,547 | 1,621 | 1,696 | 1,773 | 1,850 | 1,929 |
| PEP2003-2012 LOW GDP Case Result Mindanao | 1,000 | 1,074 | 1,159 | 1,254 | 1,360 | 1,459 | 1,563 | 1,673 | 1,789 | 1,912 | 2,041 | | | |
| PEP2002-2011 LOW GDP Case Result | 1,015 | 1,109 | 1,220 | 1,349 | 1,502 | 1,676 | 1,874 | 2,101 | 2,360 | 2,630 | | | | |
| Mindanao Actual | 995 | | | | | | | | | | | | | |

**Fig. 1.4 Demand growth curve in Luzon (constant elasticity)**



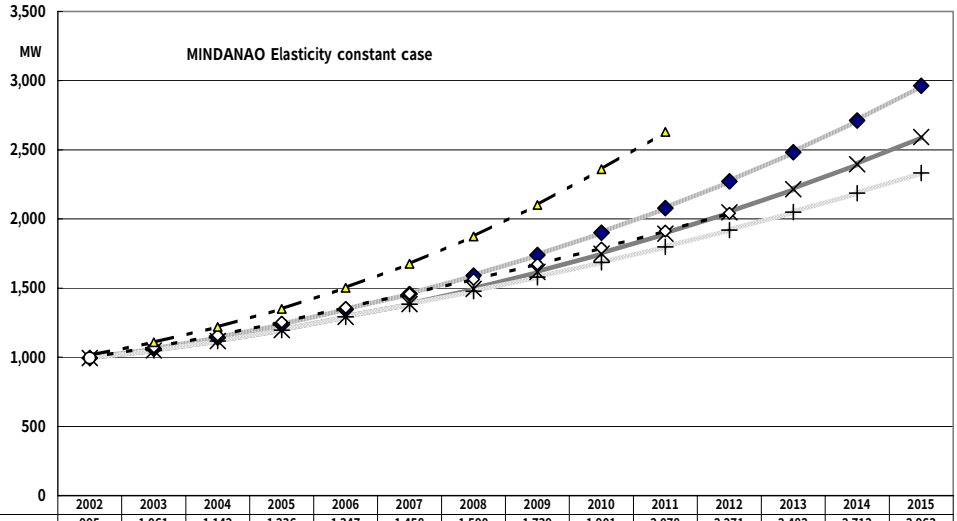

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEDA High GDP CASE Luzon | 6,039 | 6,530 | 7,120 | 7,817 | 8,628 | 9,472 | 10,470 | 11,605 | 12,862 | 14,256 | 15,800 | 17,512 | 19,409 | 21,511 |
| NEDA LOW GDP CASE Luzon | 6,039 | 6,454 | 6,967 | 7,564 | 8,272 | 8,982 | 9,822 | 10,771 | 11,812 | 12,954 | 14,206 | 15,579 | 17,084 | 18,735 |
| LOWER GDP Modified CASE Luzon | 6,039 | 6,454 | 6,967 | 7,564 | 8,272 | 8,982 | 9,724 | 10,527 | 11,397 | 12,339 | 13,358 | 14,462 | 15,656 | 16,949 |
| PEP2003-2012 LOW GDP Case Result Luzon | 6,308 | 6,752 | 7,275 | 7,835 | 8,503 | 9,161 | 9,830 | 10,548 | 11,319 | 12,149 | 13,034 | | | |
| PEP2002-2011 LOW GDP Case Result | 6,293 | 6,830 | 7,458 | 8,143 | 8,915 | 9,762 | 10,689 | 11,705 | 12,816 | 14,038 | | | | |
| Luzon Actual | 6,039 | | | | | | | | | | | | | |

**Fig. 1.5 Demand growth curve in the Visayas (constant elasticity)**




| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEDA High GDP CASE Visayas | 936 | 1,013 | 1,107 | 1,218 | 1,347 | 1,482 | 1,642 | 1,824 | 2,026 | 2,251 | 2,501 | 2,779 | 3,087 | 3,430 |
| NEDA LOW GDP CASE Visayas | 936 | 1,006 | 1,093 | 1,196 | 1,319 | 1,442 | 1,591 | 1,759 | 1,946 | 2,153 | 2,381 | 2,634 | 2,914 | 3,223 |
| LOWER GDP Modified CASE Visayas | 936 | 1,003 | 1,086 | 1,184 | 1,301 | 1,418 | 1,541 | 1,674 | 1,819 | 1,976 | 2,148 | 2,334 | 2,536 | 2,755 |
| PEP2003-2012 LOW GDP Case Result Visayas | 941 | 1,007 | 1,084 | 1,168 | 1,276 | 1,377 | 1,477 | 1,592 | 1,707 | 1,829 | 1,958 | | | |
| PEP2002-2011 LOW GDP Case Result | 1,082 | 1,192 | 1,305 | 1,459 | 1,619 | 1,790 | 1,977 | 2,203 | 2,430 | 2,657 | | | | |
| Visayas Actual | 936 | | | | | | | | | | | | | |

**Fig. 1.6 Demand growth curve in Mindanao (constant elasticity)**




| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEDA High GDP CASE Mindanao | 995 | 1,061 | 1,142 | 1,236 | 1,347 | 1,458 | 1,590 | 1,739 | 1,901 | 2,078 | 2,271 | 2,482 | 2,712 | 2,963 |
| NEDA LOW GDP CASE Mindanao | 995 | 1,049 | 1,117 | 1,197 | 1,292 | 1,384 | 1,494 | 1,617 | 1,750 | 1,893 | 2,048 | 2,216 | 2,396 | 2,591 |
| LOWER GDP Modified CASE Mindanao | 995 | 1,049 | 1,117 | 1,197 | 1,292 | 1,384 | 1,478 | 1,578 | 1,685 | 1,799 | 1,920 | 2,049 | 2,186 | 2,333 |
| PEP2003-2012 LOW GDP Case Result Mindanao | 1,000 | 1,074 | 1,159 | 1,254 | 1,360 | 1,459 | 1,563 | 1,673 | 1,789 | 1,912 | 2,041 | | | |
| PEP2002-2011 LOW GDP Case Result | 1,015 | 1,109 | 1,220 | 1,349 | 1,502 | 1,676 | 1,874 | 2,101 | 2,360 | 2,630 | | | | |
| Mindanao Actual | 995 | | | | | | | | | | | | | |

## Issues in Future Data Collection and Demand Forecasting

Using existing data collection structures and methods in countries with more advanced deregulated power sectors, particularly that of the US, it is evident that government agencies must become more responsible and dynamic in planning and forecasting compared to their roles prior to deregulation. These agencies must consider the complexity of a deregulated structure in the performance of their new functions.

Under a liberalized environment, several trade styles are mixed, such as market trading and bilateral contracts; spot, future and forward transactions are also mixed.

Considering the difficulty of gathering data needed in demand forecasting from various agencies and organizations, a new data collection scheme should be adopted. This new scheme should include:

- Collection of sales and purchases from IPP by DISCOs (PIOUs and ECs) through the DDP scheme;
- Collection of real traded energy from WESM; and
- Collecting peak data from TRANSCO.

The DOE should likewise consider expanding the period covered in data analysis, and factor in the analysis of demand characteristics, such as price elasticity—which is determined through an analysis of historical market prices—to be able to make more accurate forecasts in the future.

Ultimately, the DOE should consider upgrading its demand forecasting model by adopting an end-use model equipped with a more detailed demand structure analysis. Some developed countries have even adopted the average personal income or the average price of electricity as external variables in macro demand forecasting, creating more complex models.

## 1.4 Power Development Plan

The study extensively discusses the process of formulating the PDP to help the DOE with this new mandate. Prior to EPIRA, NPC prepared the PDP and the TDP.

**Review of the PDP 2003-2012**

The PDP was prepared based on the Low GDP (gross domestic product) demand forecast. However, the JICA team in this study prepared power development plans based on both high GDP case demand forecast and Low GDP case demand..

Based on the PDP 2003-2012, an additional generation capacity (or the total capacity of committed and indicative plants) amounting to 7,150 MW is needed to be installed into the system. This additional capacity is needed to sufficiently meet the electricity demand throughout this period, considering the retirement schedule of certain plants (about 1,145MW) from 2003-2012. Most of these plants are diesel-fed, and have been operating for more than 20 years.

While the Philippines' total actual generation reserve margin (GRM) as of 2002 stood at 56%, a power crisis in the Visayas grid, particularly in the Panay and Negros islands is looming. The reserve margin in this region is at a critical level.

The Philippine government has given priority to the development and effective use of indigenous energy sources in the formulation of its energy policies. A huge drawback in the utilization of natural gas as an energy source, however, is the relatively high cost of the gas which is primarily due to the huge investment costs to develop the Malampaya field, and the cost of transporting the gas to Batangas via the 500-kilometer pipeline.

**Existing Power Plants**

As of 2003, the Philippines' total installed capacity stood at 15,132 megawatts (MW) with a dependable capacity of 13,263 MW or 87.6% of the total installed capacity.

**Table 1.1 Installed and Dependable Capacity**

| | Philippines | | Luzon | | Visayas | | Mindanao | |
|---|---|---|---|---|---|---|---|---|
| | Installed | Dependable | Installed | Dependable | Installed | Dependable | Installed | Dependable |
| Oil-based | 3,615 | 3,120 | 2,514 | 2,236 | 530 | 416 | 570 | 468 |
| Coal | 3,958 | 3,691 | 3,769 | 3,551 | 189 | 140 | 0 | 0 |
| Geothermal | 1,932 | 1,564 | 907 | 604 | 916 | 856 | 108 | 104 |
| Hydro | 2,865 | 2,186 | 1,856 | 1,426 | 12 | 12 | 997 | 748 |
| NaturalGas | 2,763 | 2,703 | 2,763 | 2,703 | 0 | 0 | 0 | 0 |
| Total | 15,132 | 13,263 | 11,810 | 10,520 | 1,647 | 1,647 | 1,675 | 1,321 |

Source: PDP2004-2013

## Electric Energy Output

The share of coal-fired and geothermal plants account for nearly half of the Philippines' power generation mix. However, with the government's policy of pushing the development and utilization of indigenous fuels in power generation, an increased share of natural gas-fired plants in the energy mix is expected.

## Simulation for PDP (2004-2013)

The WASP system was used to determine the least cost power development while the GTMax system was used to determine optimal location and interconnection analysis. A simulation was conducted for two demand scenarios: the high GDP and the low GDP. The low GDP case was used in the study in formulating the PDP.

**Table 1.2 Simulation Demand (Low GDP, Declined Elasticity)**

| | Luzon | Visayas | Visayas Islands (Coincident Peak) | | | | | Mindanao |
|---|---|---|---|---|---|---|---|---|
| | | | Cebu | Panai | Negros | Bohol | Leyte-Samar | |
| 2002 | 6,039 | 936 | 379 | 170 | 184 | 37 | 166 | 995 |
| 2003 | 6,454 | 1,006 | 406 | 182 | 194 | 41 | 182 | 1,049 |
| 2004 | 6,937 | 1,085 | 438 | 196 | 205 | 46 | 200 | 1,112 |
| 2005 | 7,473 | 1,172 | 472 | 212 | 218 | 51 | 220 | 1,181 |
| 2006 | 8,076 | 1,269 | 510 | 229 | 232 | 56 | 242 | 1,259 |
| 2007 | 8,662 | 1,363 | 547 | 246 | 244 | 62 | 264 | 1,331 |
| 2008 | 9,323 | 1,469 | 588 | 264 | 258 | 69 | 289 | 1,412 |
| 2009 | 10,036 | 1,582 | 633 | 284 | 273 | 76 | 317 | 1,498 |
| 2010 | 10,786 | 1,702 | 679 | 305 | 288 | 83 | 346 | 1,586 |
| 2011 | 11,575 | 1,827 | 728 | 327 | 303 | 92 | 378 | 1,676 |
| 2012 | 12,406 | 1,959 | 779 | 350 | 318 | 100 | 411 | 1,769 |
| 2013 | 13,280 | 2,097 | 833 | 374 | 333 | 110 | 447 | 1,864 |
| 2014 | 14,201 | 2,243 | 889 | 400 | 349 | 120 | 486 | 1,960 |
| 2015 | 15,171 | 2,397 | 948 | 426 | 365 | 131 | 527 | 2,060 |
| 2016 | 16,285 | 2,576 | 1,016 | 457 | 384 | 144 | 575 | 2,178 |
| 2017 | 17,480 | 2,770 | 1,089 | 490 | 404 | 159 | 627 | 2,304 |
| 2018 | 18,764 | 2,977 | 1,168 | 525 | 426 | 174 | 685 | 2,436 |
| | 7.3% | 7.5% | 7.3% | 7.3% | 5.4% | 10.1% | 9.3% | 5.8% |

In Luzon, the required indicative capacity is pegged at 4,950 MW. Based on the fuel type, base load power plants (Coal: CL30) and peak load power plants (oil gas turbine: GT15) are planned. Given the high price of natural gas, middle load power plants (combined cycle: CC30) were not considered as indicative projects.

The generation reserve margin of the entire Visayas grid stood at over 50% in 2003. However, this reserve margin—particularly in the Panay and Negros island grids—is less than the ideal level due to transmission constraints. The necessary capacity additions calculated by WASP-IV is about 50 MW for each island in 2003; thus, countermeasures against the expected power deficit should already be prepared and carried out urgently.

The following committed projects are included in the column for existing capacity.

- Pinamucan Transfer from Luzon 110 MW(2004)
- Mirant Diesel 40 MW(2004)
- Northern Negros Geothermal 40 MW(2005)
- PNOC Palimpinon Geothermal 20 MW(2005)
- Victorias Biomass 50 MW(2006)

In Mindanao, base load power plants (CL05) and peak load power plants (GT05) are required for the next ten years to achieve least cost.

A price sensitivity analysis on natural gas vis-à-vis coal was conducted to help the Philippine government further develop the use of natural gas. Using the current natural gas price, simulation revealed that the construction of natural gas-fed combined cycle plants is uneconomical. The study evaluated the possibility of reducing the price of gas at 80% and 90 % of the current price. Results show that the development of combined cycle plants with an aggregate capacity of 1,500 MW can be economically justified if the gas price can be set at 90% of the current price. On the other hand, setting the gas price at 80% lower than the current price will replace all of the coal-fired power plants with natural gas-fed plants and make these plants economical. Reducing the price of natural gas, however, is a delicate issue.

The study also undertook cost analysis of the yet-committed Cebu-Negros-Panay interconnection project, which is seen as a long term solution to the power supply situation in the Visayas. Results reveal that this reinforcement is uneconomical.

**Table 1.3 Results of economic evaluation of Cebu-Negros-Panay interconnection reinforcement**

**(Unit: Million US $)**

| Commissioning Year of Upgrading | Net Present Value |
|---|---|
| 2005 | -31.5 |
| 2006 | -31.1 |
| 2007 | -30.7 |

Interconnection projects are materially affected by the power development plan. Such that if the issues in the power supply are already resolved with the addition of new generating capacity, there is no need to pursue these interconnection projects which are too costly based on the simulations made.

## Technical Issues in the Preparation of the PDP

The DOE should establish a data gathering system to facilitate the collection, collation, and dissemination of data obtained from the government agencies and private organizations to be able to help meet the tight schedule in the preparation of the PDP. A systematic training program—which integrates the use of available manuals and allow OJT—for members of

the unit tasked to formulate the PDP would be helpful to increase their proficiency in the formulation of the PDP.

**Integration with Subordinate Programs**

The DOE should integrate the TDP, DDP and MEDP in the preparation of the PDP to be able to come up with a power development plan that will meet the country's future supply requirements, taking into account the costs and the environmental implications.

## 1.5 Transmission Development Plan

This study evaluated the TDP to determine ways and means how to help TRANSCO formulate the TDP as well as to assist the DOE in evaluating the plan to determine which projects best address both the economic costs and reliability concerns.

**Review of TDP 2003**

The Philippine power system is divided into three major island grids—the Luzon, Visayas, and Mindanao grids. At present, the Luzon and the Visayas grids are connected by HVDC (Leyte-Luzon Interconnection: 350 kV, 440 MW). Mindanao, however, will only be linked with the two major islands in 2011 through the Leyte-Mindanao Interconnection Project.

The Visayas grid is further divided into five sub-grids, namely: Leyte-Samar, Cebu, Negros, Panay, Bohol. These sub-grids are connected by 230 kV and 138 kV submarine cables; these transmission lines constitute the backbone of the Visayas grid.

TRANSCO applies the N-1 rule in the TDP preparation to comply with the Grid Code. This means that the power flows of the transmission lines and the transformers are under rated capacity in their normal condition, and that there should be no interruptions or continuous blackouts in the case of the failure of one generator, transmission circuit or transformer. But while the N-1 rule is fundamentally applied, it is advantageous to expand the system step by step, giving priority to the facility with the higher probability of failure and considering its effects in an event of a failure as well as the costs involved.

Transmission expansion in the Luzon grid would involve the installation of a 230 kV backbone in Northern Luzon, eight reinforcement projects in the Batangas area (south of Metro Manila) and the transmission upgrades in Southern Luzon to meet the power generating capacity additions in these areas.

The table below shows the reinforcement projects for Northern Luzon as outlined in the original TDP 2003.

**Table 1.4 Reinforcement of the 230 kV T/L in North Luzon (original plan)**

| Project | Outline | Commissioning Year |
|---|---|---|
| Luzon T/L Upgrading Projects-1 | - San-Manuel-Concepcion T/L<br>230 kV ST-DC 2-795MCM TACSR, 80 km<br>- Concepcion-Mexico T/L<br>230 kV SP-DC 2-795MCM TACSR, 37 km | Dec. 2006 |
| Luzon T/L Upgrading Projects-2<br>(Designed for 500 kV and operated at 230 kV initially) | - Labrador-Botlan T/L<br>500 kV ST-DC 4-795MCM, 116 km<br>- Botlan-Olongapo T/L<br>500 kV ST-DC 4-795MCM, 68 km<br>- Olongapo-Hermosa T/L<br>500 kV ST-DC 4-795MCM, 26km | Jun. 2008 |
| Luzon T/L Upgrading Projects-3 | - San Manuel-Pantabangan<br>230 kV ST-DC 2-795MCM, 66 km<br>- Pantabangan-Cabanatuan<br>230 kV ST-DC 2-795MCM, 53 km<br>- Cabanatuan-Mexico<br>230 kV ST-DC 2-795MCM, 67 km | Dec. 2010 |

TRANSCO, however, revised TDP 2003 to reflect a reduction in investment costs. Based on the updated TDP, Project 2 involving the upgrading of the Labrador-Botolan, Botolan-Olongapo and Olongapo-Hermosa transmission lines, which will operate at 500 kV, will be given priority. Projects 1 and 3 will be then cancelled.

The study evaluated the original TDP and the revised TDP using system and economic analysis to determine the economic viability and reliability of the projects.

Results of the power flow analysis indicate that new measures not included in TDP 2003 are necessary, such as the installation of 500/230 kV transformers at San Manuel S/S and the reinforcement of a 230 kV transmission line between Hermosa and Mexico.

Results of the economic analysis—a comparison of the net present values of investment of each plan—shows that the original plan is more economical than the revised TDP 2003.

In addition, the initial investment of the TDP 2003 is very large because 500 kV transmission lines will initially be constructed. Meanwhile, the transmission lines will be reinforced in accordance with power development as in the original plan.

Further power development is expected for the 230 kV transmission lines between Labrador

S/S and Botolan S/S and Hermosa S/S, because they are located near the coast. The design for this transmission system should be at 500 kV as originally planned.

Given these considerations, it would be more advantageous to apply the original plan (reinforcement of the three existing transmission lines), in conjunction with the power development plan for North Luzon.

**Table 1.5 Study Results (North Luzon)**

| | | Original Plan | TDP 2003 |
|---|---|---|---|
| Outline of Plan | | Reinforcement of the three existing 230 kV transmission lines | New 500 kV transmission line (Labrador- Botolan- Hermosa: Reinforcement of the existing 230 kV transmission line) |
| Measures | 2006 | - Reinforcement of 230 kV transmission lines (San Manuel- Concepcion- Mexico) | - New 500 kV transmission line (Labrador-Botolan-Hermosa: Reinforcement of the existing 230 kV transmission line)<br>- Installation of 500/230 kV transformers at Hermosa (3 x 600 MVA)<br>- Installation of 500/230 kV transformers at San Manuel (2 x 600 MVA)<br>- Reinforcement of 230 kV transmission lines (Hermosa-Mexico) |
| | 2008 | - Reinforcement of 230 kV transmission lines (Labrador - Botolan - Hermosa) (Designed for 500 kV) | - |
| | 2010 | - Reinforcement of 230 kV transmission lines (San Manuel - Pantabangan - Cabanatuan - Mexico) | - Installation of 500/230 kV transformers at San Manuel (1 x 600 MVA)<br>- Installation of 500/230 kV transformers at San Jose (1 x 600 MVA) |
| | 2012 | - 500kV Upgrading (Labrador- Botolan- Hermosa)<br>- Installation of 500/230 kV transformers at Hermosa (3 x 600 MVA) | - Installation of 500/230 kV transformers at Hermosa (1 x 600 MVA) |
| Economic Analysis | Initial Investment | P1,666 million | P 11,660 million |
| | Total Investment | P14,574 million | P 14,566 million |
| | NPV | P10,571 million | P 13,520 million |

| | Original Plan | TDP 2003 |
|---|---|---|
| Advantage | It is possible to reinforce the transmission lines in coordination with power development for North Luzon. | - |
| Disadvantage | - | The reliability level will lower, because of split operation of the 230 kV transmission lines. |
| Remarks | | The short circuit capacity of the 230 kV system will hardly be improved. |

Under TDP 2003, eight transmission reinforcement projects in the Batangas area are in the pipeline to decongest the system. At present, serious transmission problems due to the thermal capacity limitations of the existing lines are being felt. Batangas is home to four large-scale power projects, namely: 1,200 MW Ilijan natural gas-fired power plant, 1,000 MW Sta. Rita natural gas-fired power plant, 500 MW San Lorenzo natural gas-fired power plant; and the 600 MW Calaca coal-fired power facility. To address these specific transmission constraints in the Batangas area, the following measures were drafted as part of the transmission development plan, as shown in table below.

**Table 1.6 Transmission Reinforcement for power development in Batangas**

| Project | Outline | Commissioning Year |
|---|---|---|
| New Transmission Line (San Pascual-Batangas) | 230 kV ST-DC 4-795MCM, 6.5 km<br>230 kV SP-DC 4-795MCM, 1.5 km | Jan. 2004 |
| New Transmission Line (San Pascual-San Lorenzo) | 230 kV SP-DC 4-795MCM, 1.2 km | Jan. 2004 |
| Reinforcement of T/L (New Makban-Binan) | 230 kV ST-DC 4-795MCM, 32 km | Nov. 2004 |
| Reinforcement of T/L (New Batangas-New Makban A) | 230 kV ST-DC 4-795MCM, 35 km | Feb. 2005 |
| New Transmission Line (New Makban A-Makban C) | 230 kV ST-SC 1-795MCM, 2.0 km | Dec. 2004 |
| Reinforcement of T/L (Binan-Dasmarinas) | 230 kV ST-DC 4-795MCM, 14.5 km | Sep. 2004 |
| Reinforcement of T/L (Kalayaan-Calauan) | 230 kV ST-DC 4-795MCM, 27.5 km | Dec. 2006 |
| Reinforcement of T/L (Calauan-Makban) | 230 kV ST-DC 4-795MCM, 14.4 km | Dec. 2006 |

TRANSCO is planning to build a new 500 kV switching station in Alaminos for the 500 kV transmission lines in 2006. This study evaluated these said projects. Results show that the implementation of the following measures will prevent overloading in the system if the

plants' capacity will be fully dispatched:

- New 230 kV transmission line from Sta. Rita P/S to Batangas S/S ;
- Reinforcement of the 230 kV transmission line between Batangas S/S and Makban A P/S;
- Reinforcement of the 230 kV transmission line between Makban P/S and Binan S/S;
- Reinforcement of the 230 kV transmission line between Binan S/S and Dasmarinas S/S; and
- Reinforcement of the 230 kV transmission line between Makban P/S and Kalayaan P/S.

Examination, however, of the transmission line between Makban P/S and Kalayaan P/S indicates that a double-circuit cut-in to Calauan S/S is unnecessary.

The result of the power flow analysis and transient stability analysis shows that the 500 kV Alaminos switching station is unnecessary at present since there is no concrete power development is currently planned near Ilijan P/S. Thus, this project may be deferred.

In Southern Luzon, the JICA team conducted an evaluation of TRANSCO's plan to install a 500/230 kV transformer at the Naga S/S and to operate the transmission line at 500 kV in 2004. The 275 MW Tiwi geothermal power plant and the 150 MW Bacman geothermal power plant are both located in Southern Luzon.

Result of power flow analysis reveal that the South Luzon transmission lines—with the exception of the Batangas system—are not expected to be overloaded in the case of an N-1 contingency. Therefore, TRANSCO's plan to install 500/230 kV transformers at the Naga S/S/ and operate the line at 500 kV is not necessary at the moment.

Transmission expansion projects proposed for the Visayas grid involve the uprating of the Leyte-Cebu interconnection and the interconnection between Cebu and Bohol via Mactan.

The planned upgrade of the Leyte-Cebu Interconnection from a single circuit (200 MW) to a double circuit (400 MW) is intended to allow the surplus power in Leyte to be transmitted to Cebu island, the load center in the Visayas region. However, in TDP 2003, a new interconnection project between Cebu and Bohol via Mactan was proposed in lieu of the original plan for the Leyte-Cebu upgrade.

Power flow analysis results reveal that even a new interconnection project between Bohol and Cebu is constructed will not ease the transmission constraints resulting from the transmission of surplus power from Leyte to Cebu. Nevertheless, without this project, the transmission line will be overloaded if surplus power from Leyte will be fully transmitted to Cebu.

In the Panay grid, it would be more feasible to construct a 138 kV ring in Panay to accommodate power development in the area than the transfer of the generators at Pinamucan P/S (110 MW) to Dingle S/S and the construction of a new diesel power plant, which are both being planned.

On the other hand, a major concern in the Mindanao power system is the reliability of the power transfer from the northern portion of the region to the southern portion. The demand in Mindanao is forecast to double in 10 years, but power development is concentrated in the north. Considering these factors, TRANSCO had originally planned to construct new 230 kV transmission lines from Abaga S/S in North Mindanao to Bunawan S/S in South Mindanao.

This study evaluated the necessity of the new 230 kV transmission lines between Abaga S/S and Bunawan S/S by identifying four scenarios.

**Table 1.7: Study Cases (Mindanao System)**

| | Power Development Plan | 138 kV Agus 2-Kibawe T/L |
|---|---|---|
| Case 1 | All of the new generation will be developed in North Mindanao.<br>(1) 2006<br>- Coal (200MW): North<br>(2) 2012<br>- Hydro (Agus3, 225 MW): North<br>- Coal (200 MW): North<br>- HVDC (500 MW): North | In Service |
| Case 2 | | Out of Service |
| Case 3 | 470MW generation will be developed in South Mindanao.<br>(1) 2006<br>- Coal (100 MW*): North<br>- GT (70 MW): South<br>(2) 2012<br>- Hydro (Agus3, 225 MW): North<br>- Coal (200 MW): North<br>- Davao (200 MW): South<br>- Bunawan (100 MW): South<br>- General Santos (100 MW): South | In service |
| Case 4 | | Out of Service |

*In 2006, if 70 MW GT is installed in Southern Mindanao, the 200 MW coal-fired power plant in Northern Mindanao would not be necessary, considering the demand and supply balance. Therefore, 100 MW has been adopted.

Results of the simulations show that in all cases, the adoption of 230 kV lines will not be needed, and the transmission lines will have to operate only at 138 kV. However, the new transmission lines should be designed for 230 kV to accommodate future increases in demand and the addition of new plants.

After the completion of the Leyte-Mindanao Interconnection Project, if a large volume of power flows from Leyte, a voltage problem may ensue. Therefore, a detailed study to upgrade to 230 kV is recommended.

**Table 1.8: Summary (Mindanao System)**

| Year | Case | Power Development in Southern Mindanao | Agus 2-Kibawe Transmission Line | Necessary Measures |
|---|---|---|---|---|
| 2006 | Case 1 | None | In service | 138 kV Pulangui 4-Bunawan |
| | Case 2 | None | Out of Service | 138 kV Abaga-Kirahon<br>138kV Kirahon-Pulangui 4<br>138 kV Pulangui 4-Kibawe<br>138 kV Pulangui 4-Bunawan |
| | Case 3 | 70MW | In service | None |
| | Case 4 | 70MW | Out of Service | 138 kV Abaga-Kirahon<br>138 kV Kirahon-Pulangui 4<br>138 kV Pulangui 4-Kibawe |
| 2012 | Case 1 | None | In Service | 138 kV Abaga-Kirahon<br>138 kV Kirahon-Pulangui 4<br>138 kV Pulangui 4-Bunawan |
| | Case 2 | None | Out of Service | 138 kV Abaga-Kirahon<br>138 kV Kirahon-Pulangui 4<br>138 kV Pulangui 4-Kibawe<br>138 kV Pulangui 4-Bunawan |
| | Case 3 | 470 MW | In Service | None |
| | Case 4 | 470 MW | Out of Service | 138 kV Abaga-Kirahon<br>138 kV Kirahon-Pulangui 4<br>138 kV Pulangui 4-Kibawe |

**Interconnection Projects**

There are two options to mitigate the power shortage in Panay. One is the capacity addition in Panay, while the other is upgrading the Cebu-Negros and the Negros-Panay Interconnection Line. This study evaluated the economics of these two options.

The Cebu, Negros, and Panay (CNP) islands have already been connected by single-circuit submarine cables. Therefore, it is not expected that the peak demand will decrease as a result of interconnection. Reduction in the reserve margin is not expected, either. The only advantage of the CNP interconnection is a reduction in fuel cost.

The study focused on the reduction in fuel cost (which is calculated using GTMax) and the capital cost of the interconnection. The study reveals that the net present values are negative in all cases. This means that a capacity addition in Panay and Negros is more economical than the CNP upgrade. (However, it should be noted that the results could change largely

depending on the assumptions, such as capacity addition.)

Although the upgrade uneconomical, there is a felt need to implement the project to avert a power crisis in Panay. Power shortage might occur again in Panay in 2008 in the event that there are no capacity additions, aside from the current committed projects.

The JICA study team also evaluated the planned Leyte-Mindanao interconnection, which would link Mindanao with the other two major islands. Economic analysis indicate that the Leyte-Mindanao Interconnection is uneconomical. However, the interconnection project is seen to compensate for the unexpected increase in demand or any delay in capacity addition projects. It will allow the transport of power from the Luzon System or the Visayas System to the Mindanao System. In addition, the interconnection will improve reliability and will enhance the establishment of the spot market.

**Issues and Recommendations in Preparing and Evaluating the TDP**

The study also looked for ways to assist the DOE in the TDP preparation and evaluation, noting that the number of staff responsible for TDP should be increased, and the staff responsible for DDP should be assigned as soon as possible.

Considering the delays encountered in the preparation of the 2003 TDP, thus, the study team suggested changes in the schedule to meet the deadline set under EPIRA. Demand forecasting should be finalized by middle of May; PDP by middle of June; and TRANSCO should have submitted TDP to the DOE for evaluation by the middle of July.

Close coordination between the DOE and TRANSCO should be in place to facilitate the collection and evaluation of data.

## 1.6 Rural Electrification Plan

This study examined the Philippine Rural Electrification Plan (REP), its components, the roles and the workflow between agencies involved in rural electrification, and the implementation status of the electrification program.

Aiming to assist in the formulation of the MEDP and the DDP which are primary components of the REP, a GIS database for MEDP and a data collection for DDP were created.

**Assessment of the O-Ilaw Program**

Following the establishment of the O-Ilaw Program Team in 2000—an inter-agency task force with the mandate to accelerate rural electrification initiatives—the status of electrification at the barangay level tremendously improved.

From only 755 barangays energized in 1999, the number of barangays energized rose to 1,699 in 2002. By end-December 2002, there were only 5,409 barangays still without electricity.

The O-Ilaw Program aims to achieve the 100% energization of the country's 41,995 barangays by 2006 and the energization of about 90% of total potential households by 2017. The program aims to do this by coordinating rural electrification projects of various government agencies, LGUs, PIOUs, RESCOs, and private companies.

**Framework for the Rural Electrification Plan**

Rural electrification in the Philippines is pursued along three fronts. One is through grid extension. The second, through the management of existing generators and installation of new power stations in rural areas covered by Small Power Utilities Group (SPUG), and introduction of individual power systems in rural areas using funds from the DOE budget as allocated by Congress. And finally, through the privatization of SPUG.

The REP coordinates these three programs. Components of the REP are the MEDP—which contains reports on SPUG's management, its existing facility operation, and installation of individual power systems—and the DDP—which contains reports on the management of existing grid network and electrification through grid extension by

NEA/ECs and PIOUs.

**Entities Involved in Promoting Rural Electrification**

While there are different government agencies involved in the rural electrification, the responsibility of overseeing the electrification in the countryside is significantly a task of NEA. The NEA oversees the operations of the ECs to provide distribution service to their franchise areas. NEA also serves as a government financial institution by providing most of the funding requirements of the ECs' electrification program.

While EPIRA mandates the privatization of NPC, it assured the continued existence of NPC-SPUG, whose main role is to provide electricity in the small islands.

EPIRA likewise reiterated DOE's pivotal role in promoting rural electrification and encouraged the participation of PIOUs, LGUs, and QTPs in the rural electrification program. EPIRA likewise allowed and encouraged QTPs to participate in the program.

It is expected that the bulk of funding for rural electrification will in the future be borne by the QTPs.

**Database**

The main issues that need to be considered in rural electrification are selection and prioritization of areas to be covered by the program. Therefore, close attention should be given to the management of data needed in the formulation of an electrification plan for a particular area—including data on the actual rate of electrification, as well as the number and exact location of unenergized areas.

To ensure the accuracy of the data included in drafting electrification plans, the DOE should establish a database that will facilitate the promotion, implementation, and management of electrification programs.

In the course of this study, the study team prepared a map that visually reflects the status of the electrification program and the electrification rate at the municipal/city level. The study team will transfer these maps to DOE and ask it to complete these maps for the database, to aid in the implementation, promotion, and management of the rural electrification program.

## Status of SPUG Operations

Operation forecasts made by SPUG for the next three years (2003-2006) indicates increasing power sales and revenues.

But while revenues and sales are seen to increase, operations and maintenance expenses are expected to grow faster. By 2006, operating expenses would triple to P 16.17 billion from P 6.2 billion in 2002.

Thus, a greater subsidy amounting up to P 9.36 billion come 2006 would be needed to sustain SPUG's operations. In 2002, actual subsidy of P 3.98 billion was channeled to finance SPUG's operations.

Operating costs, particularly fuel costs, account for a large portion of SPUG's expenditures. Fuel costs for 2006 are projected to reach P 6.99 billion—three times the actual cost for 2002 of P2.10 billion.

To find ways and means to reduce costs, there is therefore a need to determine the current condition of SPUG facilities.

## Applicability of Decentralized Power System in Rural Electrification

Currently, unenergized areas in the Philippines are quite inaccessible and that demand per household in rural areas is generally quite small, usually up to 100 watts. In these areas, people are likely to use electricity for small electric appliances such as lights, TV, and radio.

Therefore, it is essential that planning electrification projects should strongly consider the introduction of an alternative generation methods such as diesel, photovoltaic, micro-hydro and other effective systems that use indigenous energy (e.g., biogas, natural gas) for power generation. It will also be advantageous to consider the best combination of a decentralized system and grid extension for these isolated areas.

Also, existing facilities may be utilized in forming the new total system by either transferring facilities to the targeted area for re-utilization or connecting the individual system to a new grid line.

## Factors to be Considered in Implementing Rural Electrification Projects

Rural electrification is foreseen to contribute to the creation of business opportunities and will reduce population shift. Furthermore, electrification has a domino effect, such as improvement in information accessibility, increase in educational opportunities and other benefits that will raise the standard of living of residents in the rural areas of the Philippines.

To support the rural electrification program, EPIRA mandated the inclusion of rural electrification as one of the components of the universal charge. However, under current practice, these public subsidies are not sufficient in funding the rural electrification program. A prime example would be SPUG, which is financially hard-pressed in maintaining its diesel-fired plants due to increasing fuel costs.

Likewise, ECs could not effectively implement electrification projects since subsidies from NEA are insufficient.

Therefore, for DOE to attain its goal of total electrification the country's barangays by 2006, an increase in private investment in the program is imperative.

To introduce further private investment, DOE should undertake the following items, such as:

- Establishment an appropriate database for all unenergized barangays;
- Implementation of management improvement in EC and SPUG;
- Promotion of the utilization of potential renewable energy;
- Increase subsidies from ME-UC; and
- Creation of new tools to induce further private investment.

Aside from the foregoing measures, there is likewise a need for government subsidy utilizing ER 1-94 and the universal charge; promotion of management efficiency at ECs; and provision of expertise on a long-term basis to prepare a feasible and workable plan if the government is to achieve its energization goals.

## 1.7 Investment Promotion

This study likewise provides an overview of the investment incentives available to prospective players in the Philippine power sector. The legal framework; government agencies involved; investment procedures; and the impediments that pervade the Philippine investment climate, were examined.

**Promoting Investments in the Philippine Power Sector**

In this study, three issues in the Philippine power sector were analyzed and compared with other ASEAN countries. These issues include:

1. The structure of the Philippine power sector;
2. The current status of investment procedures in the Philippine power sector; and
3. The status of proposed incentives in the electric power business.

A resolution of these issues, as well as the recommendations of the study team, was likewise provided.

In comparing the Philippine model, three ASEAN countries were chosen: Thailand, Indonesia, and Vietnam. The study team chose these countries since—like the Philippines—the liberalization of their respective electric power sectors is currently ongoing.

**Status of the Investment Promotion Policy in the Philippine Power Sector**

The implementation of the law is currently underway. The steps taken by the government to implement EPIRA include: (a) disposal of certain NPC generation assets; (b) establishment of TRANSCO; and (c) the establishment of WESM.

Unfortunately, the privatization is not proceeding as planned, as the entry of private investments in the Philippine power sector—which is the key to power sector reform—has stagnated.

The major factors for this hesitation of private investors to infuse capital into the power sector due to perceived political and regulatory risks and increased business risks, especially for IPPs.

Specific problems regarding the investment procedures (based on interviews with foreign corporations operating in the Philippines and government agencies such as BOI) for prospective investors in the power sector can be summarized as follows:

- Approval period: The time line in securing a business license is unpredictable and long;
- Unclear approval process: The number of approvals and the processes for approval are not systematic;
- Uncertainty in the approval process indicated by the discrepancy between the law provisions and the actual implementation of approval process; and
- Limited investment incentives granted by EPIRA.

**Proposals to Improve Investment Policies and Procedures for the Power Sector**

With the identification of factors hindering private investments in the Philippine power sector, proposals were made on how to improve investment promotion by reforming the existing investment policies and procedures.

Recommendations were made with the end-view of reducing risks to investors and at the same time minimize costs for the power sector as a whole.

Establishing efficient investment procedures and the effective dissemination of information on these procedures are equally important to entice investments in the power sector.

Likewise, several incentives may be considered. These include:

- Extension of the period for tax exemption or income tax holiday (ITH);
- Flexibility in the reckoning period for ITH availment;
- Improvement in the implementation of the VAT exemption, which is presently cumbersome and time-consuming;
- Exemption from tariffs and duties;
- Reduction of the tax rate on dividends;
- Reduction of tariff for LNG imported from non-ASEAN countries to a level at par with LNG imported from ASEAN countries; and
- Grant of investment incentives for IPPs.

Energy Investment Promotion Office

More importantly, this part of the report explored the current staffing pattern; functions, duties, and responsibilities; capabilities of the Philippine DOE's Energy Investment and Promotion Office (EIPO).

The study team's findings and recommendations on improving the office's function and role as a marketing and investment promotion arm are reviewed, as follows:

a. To supply information on each and every energy project;
b. To seek potential investors and promote investment opportunities to these investors;
c. On a continuous basis, to provide information and updates on the status of investments, as well as to coordinate with other government agencies involved in investments promotion, such as the BOI; and
d. To provide an environment (such as a website) that would allow the free exchange of information with investors and prospective investors.

In addition to close coordination with several government agencies that are in one way or the other involved in investments in the energy sector, EIPO should be imbued with the following responsibilities to further enhance its role:

(1) EIPO as "One-stop shop";
(2) Close cooperation with BOI and government agencies involved in the investment incentives process; and
(3) Communication with potential investors via the World Wide Web.

Appendices are included in this chapter to help provide an insight on the different power sector models in ASEAN and the respective investment incentives offered by each country. These are:

(1) Structure of EPIRA;
(2) Basic Philippine Framework on Foreign Investments;
(3) Problems Encountered by Independent Power Producers (IPPs) Operating in the Philippines;
(4) Structures of the Thai, Indonesian, and Vietnamese Power Sectors; and
(5) Investments Promotion in the Thai, Indonesian, and Vietnamese Power Sectors.

## Chapter 2 Policy Framework in the Electric Power Sector

### 2.1 Electric Power Price in the Philippines

The retail sales price in the Philippines is the second highest in Asian countries, following that in Japan. The retail sales prices (2001 fiscal year) of Asian countries are shown in Table 2.1.

**Table 2.1: Comparison of electricity retail sales price (2001 fiscal year)**

US cent/kWh

| | Philippines | Japan | Indonesia | Vietnam | Thailand | Malaysia | China | South Korea |
|---|---|---|---|---|---|---|---|---|
| Electric power price | 10.9 | 13.3 | 3.2 | 4.81 | 5.88 | 6.05 | 4.77 | 5.69 |
| Electric power company | MERALCO | average of whole utilities | PLN | EVN | MEA | TNB | National electric power Corp. | KEPCO |

Source: Japan Electric Power Information Center

The retail sales price in the Philippines was not high before 1990. To supplement the electric power shortage that continued from the late 1980s to 1993, the accelerated introduction of IPPs, called First Track, enabled costly IPPs to participate in the energy sales market and, as a result, retail sales price rose sharply.

**Table 2.2: Transition of average wholesale electric power price of NPC**

A peso/kWh

| Area | 1990 | 1995 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|
| Luzon | 1.20 | 1.85 | 2.84 | 3.34 | 3.01 |
| Visayas | 1.24 | 1.93 | 2.58 | 3.23 | 3.08 |
| Mindanao | 0.70 | 1.28 | 1.67 | 1.93 | 2.02 |
| National average | 1.13 | 1.77 | 3.65 | 3.12 | 2.90 |

Source: 2001 NPC Annual Report

In response to the advice of IMF and ADB, Philippine government enacted, in June 2001, EPIRA for reduction of the electricity retail price and the compression of NPC's huge debt, which swelled to approximately 800 million peso: 300 million peso long-term debts and 500 million lease obligation - BOT specified in 2001 NPC Annual Report, by unbundling the vertical integration of NPC and implementing a electric power wholesale market, and selling NPC's assets. The policy objectives of the EPIRA, among others, are 1) to ensure

transparent and reasonable prices of electricity in a regime of free and fair competitive market; 2) transparent and orderly privatization of assets and liabilities of NPC. Thus, the generation, transmission and distribution were unbundled.

## 2.2 The Situation of the Electric Power Industry Reform Act

Some mandated items in EPIRA are nearing the implementation deadline, but are still at the planning stage, although more than two years have passed since the enforcement in June, 2001. In particular, since the privatization of TRANSCO, the sale of NPC assets and the introduction of WESM are behind schedule, which are preconditions for open access in the retail market, like open access to the retail market, and it takes longer to realize all the mandated items in EPIRA.

### 2.2.1 Progress of NPC privatization

PSALM owns the assets and liabilities of NPC. And in line with the privatization of NPC, President Gloria Macapagal Arroyo approved on October 4, 2002 the privatization plan for the generation and transmission assets of NPC prepared by PSALM. This came after the approval of the privatization plan by the Joint Congressional Power Commission (JCPC) Resolution No. 2002-1 dated 13 March 2002 and JCPC Resolution No.2002-2 dated 29 August 2002.

Originally, the NPC privatization plan was supposed to follow three steps: (1) Congress' approval on the TRANSCO franchise bill , (2) transfer operational responsibility of TRANSCO to the concessionaire, (3) sale of power generation equipment.

Although President Arroyo acknowledged the necessity for TRANSCO franchise bill, since the prospect of the law's passage through Senate was unclear as of January 2003, PSALM launched the plan that separates the process of TRANSCO privatization from the TRANSCO franchise bill. PSALM performed official notification of the TRANSCO sale through domestic and international newspapers on January 27 2003.

However, since the bid to select the concessionaire for TRANSCO in July 2003 was uncompleted, privatization was behind schedule. The planned schedule and track record are shown in the following pages.

Although the second bid of TRANSCO was scheduled for September 2003, only one company showed an intention to bid, and the second bid was also unsuccessful. The

Concession Contract will be an exclusive contract between TRANSCO and the bidder. The concessionaire will rent the assets of TRANSCO and pay a rental fee to the government.

In response to the failure of TRANSCO concessionaire selection, since early September 2003 PSALM has already distributed the preliminary Information Memorandum (IM) to companies and investors that have submitted their expression of interest, changing the original process to sell generation assets after the selection of the TRANSCO concessionaire. As of November 2003 37 parties submitted expression of interest and 34 acquired preliminary IM. The first invitation for bidding if expected to commence in December for the sale of Navotas Power Plant. Judging from the track record of the TRANSCO bidding process, finishing the first bidding for generation assets takes about six months. Generation assets were classified into six groups in the early stage of EPIRA implementation. PSALM is likely to sell generation assets by power plants, avoiding the combination of investor-preferred assets and those unpreferred. Whether the sale of some if not all power generation assets is conducted by May 2004 when the Philippines presidential election is scheduled is uncertain.

### 2.2.2 Wholesale Electricity Spot Market (WESM)

According to EPIRA, DOE has to establish WESM within one year after the effectivity of EPIRA. Originally, commercial operation would be followed by a one-year trial operation. Since the US$7 million release from the World Bank was canceled, however, and given to ADB, WESM establishment is behind schedule.

Of the US$ 600 million Power Sector Reform Loan from ADB and JBIC, the third tranche, US$ 200 million will be released if the interim operation of WESM is successful. Therefore, the delay in WESM establishment leads to a delay of EPIRA implementation. WESM establishment is one of the critical points for EPIRA implementation.

DOE is scheduling commencement of a demonstration market for December 2003 and a management system for June 2004 respectively.

WESM establishment is expected to be delayed by more than two years from the original schedule.

## 2.3 Role and Organization of DOE

### 2.3.1 DOE organizational chart and staff allocation

Along with EPIRA enforcement, DOE is advancing organizational reform responding to changes in roles and is promoting efficient operation. DOE submitted its organizational reformation proposal to the Department of Budget Management (DBM). DBM has reviewed the necessary budget to establish the new organization. To push through electric power reformation as well as to manage the whole electric power industry, the Electric Power Industry Management Bureau (EPIMB) was established

The role of each division in EPIMB is shown in Table 2.5. The planning division is charge of planning PDP, MEDP, DDP, and examination of TDP. However, even though more than two years have passed since EPIRA enforcement, as shown in Table 2.6, only half of the full staff capacity has been assigned.

**Table 2.3: Role of the power bureau each division**

| Power Planning and Development Division | Power Market Development Division | Rural Electrification Administration and Management Division |
|---|---|---|
| - Supply Expansion Plan<br>- Transmission Development Plan<br>-Distribution Development Plan<br>-Missionary Electrification Plan | - Electricity market development and investigation<br>- Monitoring and evaluation of EPIRA implementation | - Rural Electrification Promotion and Management<br>- Rural Electrification Project Administration |

Source: DOE

**Table 2.4: Comparison of actual staff members and personnel plan**

| | Planning Division | Market Division | Rural Division | Total |
|---|---|---|---|---|
| Full Capacity | 13 | 12 | 28 | 53 |
| Assigned Number | 8 | N.A. | N.A. | About 25 |

Source: DOE

There are enough senior members, but lower level staff are insufficient in number.

### 2.3.2 Roles and issues of DOE provided in EPIRA

Subject to EPIRA Chapter III, Section 37, 17 roles of DOE are clearly stated. Among these roles, DOE has to attain efficient use of energy and stable supply of cheap electricity through the plan for the energy sector. To achieve EPIRA's objectives, DOE is also asked to promote sector supply expansion and rural electrification through private sector initiative. According to Section 37, DOE is required to update the Philippine Energy Plan (PEP) and PDP every year. In addition, periodical reports in April and October on EPIRA implementation situation under Section 30, and establishment of WESM within one year of EPIRA enforcement under Section 61 are mandated to DOE.

IRR Section7 implies the necessity of DOE arranging distribution development plans that DUs submit to DOE. IRR Section 13 mandates DOE to formulate a five-year rural electrification plan, a Missionary Electrification Development Plan (MEDP), to which NPC-SPUG refers when it petitions the Universal Charge.

### 2.3.3 Issues in the Electric Power Industry Management Bureau (EPIMB)

(1) Establishment of new organization

Although the new organization of EPIMB, DOE, is almost solidified, only the supervising SRS class staff was determined as of August 2003. About half of the full capacity of EPIMB is still vacant. To process important tasks mandated to EPIMB, there are not enough staff with suitable ability.

Moreover, it is necessary to consider the introduction of monetary incentives other than high quality jobs to prevent talented people from leaving.

(2) Enhancement for DOE staff

The staff of EPIMB, DOE, is requested to have following abilities to complete new tasks.

- Knowledge and skills on simulations

DOE needs clear understanding on the fundamentals of simulation models so that it can modify the simulation models by itself to make the necessary adjustments. Since PDP plays the role of Information Memorandum that gives investors a view of the Philippines electric power sector, DOE has not only to formulate plans considering basic data, such as assumptions, fluctuations in fuel price and exchange rate, and the impact of WESM, for demand forecasting and the supply expansion plan, but has also to provide the data requested

by investors.

- Good Governance

Because DOE stands at the center of energy-related organizations, called an energy family, DOE should strongly lead and support these organizations to implement the various plans.

The electric power industry is at a transition stage and many activities are underway to establish appropriate governance which includes guidelines and framework, among others, consistent with EPIRA. In particular, in the rural electrification section, formulating a long-term plan at country level and conducting individual electrification projects based on the plan seem to be a shortcut to desired goals.

(3) Role of ERC and DOE

Although DOE can draw a future image of an electric power sector, the range of DOE's authority is limited because implementation of a project is subject to the judgment of ERC. For example, even if DOE publicizes the necessity for transmission line reinforcement in the future, the concessionaire that succeeds in the operation of the transmission line judges whether it should carry out the plan, and ERC has authority to approve the plan.

There needs to be an independent regulatory agency, ERC, to maintain fairness in tariffs, but unless the authority to challenge ERC is granted to DOE, realization of the projects planned in TDP and MEDP is not easy.

(4) Establishment of a database

Establishing a data collection flow is the first priority because most data necessary for PDP are collected from outside DOE. DOE needs to reinforce the flow established in the JICA study so that it can be used hereafter.

Since PDP requires a wide range of data, preventing data loss and maintaining data credibility are problems. DOE should manage valuable data systematically and utilize it effectively. Although many rural electrification projects have been carried out by the Philippines government and the donors so far, the data and information are saved in paper format. Since some data were lost and project information is kept in different divisions, even an inventory is not adequately recognized. Due to this problem, not only planning a new project is difficult, but also duplication of projects has occurred. At first, DOE collects the remaining data of the rural electrification projects and should manage historical data appropriately using an electronic data format.

## 2.4 Proposal for electric power policy

### 2.4.1 NPC Privatization

(1) The necessity for the TRANSCO franchise bill

The TRANSCO franchise bill aims for the concessionaire to operate transmission system, build new transmission lines, maintain the existing infrastructure, and correct transmission tariffs instead of having an exclusive operating area and operating TRANSCO infrastructure. Although the American Chamber of Commerce in the Philippines is asking the Philippines government for early enactment of the law, investor interest is still low. Only one company applied for the second bidding offered in September 2003.

It is better to remove the concerns of potential bidders for TRANSCO. While continuing the current sales process, PSALM should clarify the conditions of congressional approval on franchise transfer to the concessionaire, and monetary return for the duty of concessionaire.

(2) Sale of power generation assets

Since the government does not guarantee returns on investment, selling some of the plants will be difficult except for competitive base load plants. If asset sales are assumed to be the first priority, the government should allow a partial guarantee and an investment recovery scheme for plants that are less attractive to investors.

If investors purchased the twenty- and thirty-year-old plants, they would consider scrapping-and-building the current plant. To renovate these plants, construction of new fuel infrastructure may be required. In this case, the government can construct a fuel infrastructure and recover the expense by collecting lease fees over a long period. This scheme will reduce the initial investment by the investor and mitigate the risk in cost recovery.

### 2.4.2 Investment Promotion to the Electric Power Sector

(1) Information service for investors

The main role of the Energy Investment Promotion Office (EIPO) is an information service for investors and project developers. Therefore, JICA assisted EIPO in building an information distribution system on the DOE web page.

The promotion of investment cannot be attained only by web page construction. Hence,

DOE needs to update the data of the information distribution system and upload the data requested by those concerned.

(2) Clarification of investment-related procedure
EIPO, DOE, as a primary contact point in investment, should clarify the investment procedure tailored to investment types and function as a guide for investors. Moreover, DOE should propose to the appropriate organizations with authority in the system a revision of the systems that impede investment, referring to investors' opinions.

(3) Implementation with continuity
To reduce the electricity tariff, curbing the wholesale price of IPPs is effective. From the viewpoint of investors, compulsory reduction of the once-contracted wholesale price by EPIRA might terminate investment in Philippine energy sector.

DOE needs to eliminate the idea that political risk in the Philippines is high, releasing the contract reexamination information of IPP as long as confidentiality can be maintained.

### 2.4.3 Role of Public Institutions in Rural Electrification

(1) Implementation based on a long-term plan
DOE needs to arrange fundamental data, such as barangay location, the number of barangays, and the number of households, to formulate a long-term electrification plan.

Based on the created database, DOE should formulate a long-range plan to achieve the concrete barangay electrification goal, considering financing, electrification implementation methods, electrification cost, and equipment maintenance methods in cooperation with NEA and SPUG.

(2) Active Use of the Universal Charge
To make the universal charge an effective fund source for missionary electrification, DOE and SPUG should take the following measures.

- Conducting a hearing to ERC prior to petition
- Reexamining the petition based on the hearing results
- Formulating a long-term equipment implementation plan
- Reducing diesel operational expenses and diverting them for new equipment.
- Applying the universal charge to electrification with renewable energy

(3) Operational expenses rationalization for NPC-SPUG's equipment
Refer to Section 6, Rural Electrification.

(4) Introduction plan for private investment
Refer to Section 6, Rural Electrification

### 2.4.4 Validity of the PDP Formulation Process

(1) Comparison of the track record with the master schedule
The master schedule and the track record of PDP formulation are shown in Table 2.11. Difficulty in completing PDP by September 15 and submitting it to the Philippines Congress is assumed from the track record below.

The JICA Study team started demand forecasting in April 2003, based on the tentative GDP growth scenario offered by NEDA, and finished the calculation by the end of May 2003. However, obtaining approval from DOE senior management on the demand-forecasting results took time, and, as a result, the formulation of the supply expansion plan and the transmission development plan, which use approved demand forecasting results, were more than two months behind the master schedule.

If DOE complies with the mandate, PDP submission to Congress by September 15th, it needs to finalize the demand forecasting by the end of May, while establishing the approval process inside DOE. If this is difficult, the submission schedule should be revised.

(2) DOE as a regulatory authority
In the Philippines, DOE will perform demand forecasting and formulate the supply expansion plan mandated in EPIRA. To compare practices for demand forecasting, forecasting in developed nations in which the deregulation of power industry has progressed is summarized below.

**Table 2.5: Role of government organization in demand forecasting As of September, 2003**

| Country | Philippines | Japan | United States | Britain | Norway | Sweden | Germany |
|---|---|---|---|---|---|---|---|
| Demand-forecasting organization | Government organization | Utilities union | Government organization | Power system operator | Government organization | Government organization | Consultant |
| Name | DOE | Japanese electric power investigation committee | DOE (EIA) | NGC | Statistics Norway | Energy Administration | Prognos AG |
| Use | Supply Expansion Transmission Development | Transmission Development | Policy making | Transmission Development | Transmission Development Policy making | Policy making CO2 emissions | Policy making |
| Calculation frequency | Every year | Every year | Every year | Every year | Every year | Irregular | Every Three year |
| Data source | DU | Electric power company | EIA FERC | DU Large scale user | N.A. | Central Statistical Office | Central Statistical Office |
| Approach | Macro | Combination of Micro and Macro | Combination of Micro and Macro | Combination of Micro and Macro | Combination of Micro and Macro | Industry: Micro Other sectors: Macro | Combination of Micro and Macro |
| Degree of retail liberalization | 0% | 30% | 0 - 100% depending on the state | 100% | 100% | 100% | 100% |

Source: a Japanese electric power investigation committee, "example of electricity demand forecasting in European countries and America," and the Energy Economics Institute, Japan, "present situation of electric power reform in overseas countries"

In deregulation-advanced nations, demand forecasting results are used for energy policy making or expansion of transmission lines, which is public infrastructure. Since supply expansion in Western countries is the responsibility of individual companies , there are no countries that have formulated countrywide a power development program. For example, in Japan, each electric power company expands its power supply capacity based on its original electric supply plan.

Although DOE conducts policy making, statistical analysis, and simulation in parallel, because it is understaffed, its analytical works tend to be insufficient. DOE should entrust most of PDP preparation work to a specialized agency that will be newly founded and specialize in policy making and administrative work.

## Chapter 3 Electrical power demand forecasting

### 3.1 Survey results of economy and electrical demand in the Philippines

#### 3.1.1 Historical census data in the Philippines

(1) Population

The Philippines is 300,000 square kilometers. It consists of about 7000 islands of various sizes. According to the results of a national census in 2000, the population in the Philippines is a little over 75 million.

The recent growth rate in population is almost 2%. According to a report written by NSO and NSCB, and also according to the United Nations, the population in the Philippines will reach 100 million between the Years 2015 and 2020.

(2) Growth of the economy

In the early 90s, the Philippines experienced a low growth period. However, the Philippines experienced a high growth rate of approximately 5% in the mid 90s. In 1998, negative growth was recorded as a result of the influence of the currency crisis in Asia. After the currency crisis, a range between 3 and 4% has been maintained.

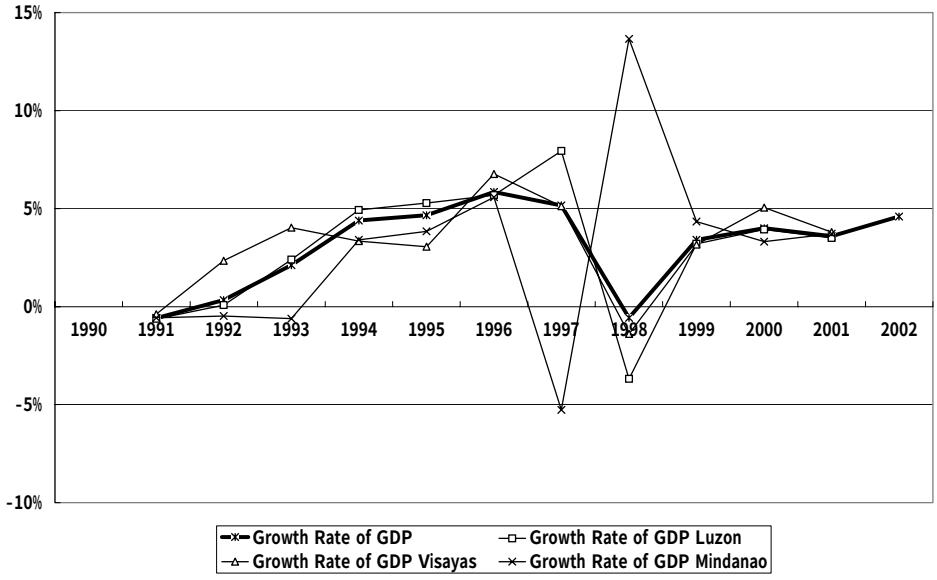



**Fig. 3.1 Historical GDP Growth Rate**

### 3.1.2 Historical trends in electrical demand

Demand growth of electricity has a strong relationship with census data such as population growth and economical data.

(1) Electrical Demand Growth

Because there was an economic recession until 1993 and the supply capacity was short through this period, demand growth was limited. However, from 1994 to 1996, this problem disappeared, so a high demand growth of over 10% was experienced. In the late 90s, due to a currency crisis, there was again a low growth rate.

One of the significant characteristics of energy sales in electric power sector in Philippines is that share of the sales to industrial sector is relatively lower than other countries. Fig.3.6 shown below is the comparison of share of sales energy in electric power sector among the countries. In the most of the developing and developed countries, share of sales to industrial sector covers 50% or more, except in the United States. However, in the case of MERALCO, this share is almost 30%. Therefore, it can be said that business of electric power sector is strongly depending on sales in non-industrial sector such as residential and commercial.

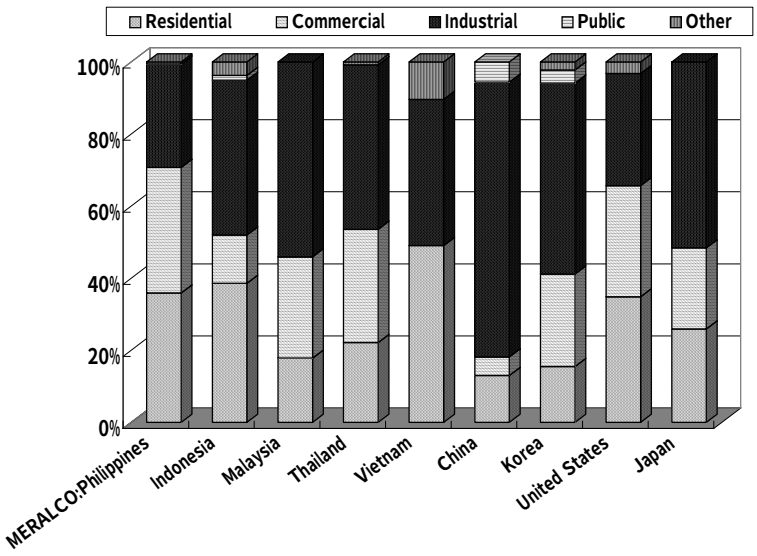



**Fig. 3.1 Comparison of share of sales to each customer sectors**

Reliability and quality of supply must be important factor which influence growth rate. Especially, in Philippines, demand of large industrial customer has not increased for these 15 years. Those industrial customers have invested self-generations at there factories.

(2) Electric consumption per head

Even though the GDP/capita value was relatively low through the 90s, electrical consumption per head grew after 1993.

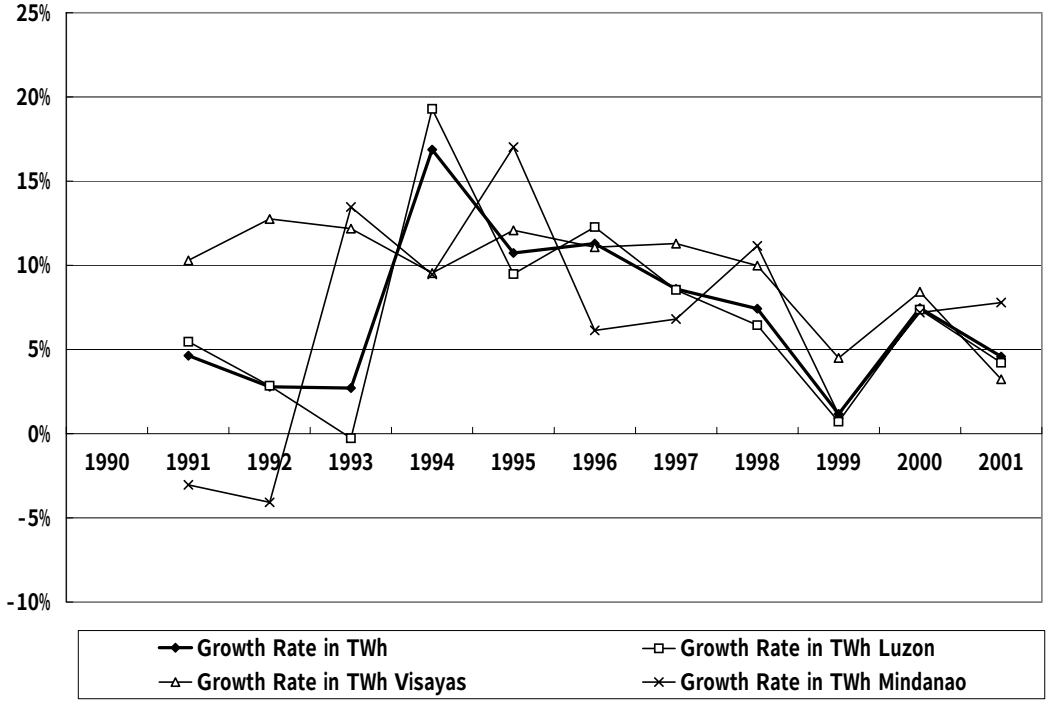



**Fig. 3.2 Historical electrical demand growth**

(3) Load factor

Historical data of load factor (meaning "Demand for Energy"/("Peak demand" * 8760 hours)) of the entire Philippines and each main grid in various areas are shown in next figure.Load factor is usually considered because it declines, while the percentage of residential demand declines due to GDP growth. However, there is no indication that load factor in the Philippines is decreasing. This is likely to be because the industrial structure of the Philippines strongly depends on agriculture and the service sector. In addition, electronics industries usually invest in their own generators, and this demand is not included in the power sector's demand.

(4) Direct sales on transmission system

According to NPC data, the amount of direct sales did not increase in the 90s, and the percentage lowered against total NPC sales by. From 1998, these direct sales are to replace IPP sales.

### 3.1.3 Economic perspectives in the Philippines

(1) Short-term economic growth in the Philippines

The GDP forecast for 2003 and 2004 disclosed in early 2003 by NEDA is as follows.

NEDA: year 2003:4.2 - 5.2% year 2004: 4.9 - 5.8%

The other GDP growth forecasts in the Philippines according to foreign public and private organizations are as follows. These data are same level as the average forecasted ASEAN growth rate of 4.0%.

| | | | | |
|---|---|---|---|---|
| IMF | : | year 2003 | 4.0% | year 2004 4.0% |
| ADB | : | year 2003 | 4.0% | year 2004 4.5% |
| UFJ Bank (Japan) | : | year 2003 | 3.9% | year 2004 4.3% |
| Mizuho Bank (Japan) | : | year 2003 | 4.3% | year 2004 4.5% |
| Nomura Research Institute (Japan) | : | year 2003 | 3.8% | year 2004 4.1% |
| Mitsubishi Research Institute (Japan) | : | year 2003 | 4.2% | year 2004 3.9% |

The higher NEDA forecast is 1.0 point higher than other forecasts for 2003. Forecasts for 2004 by NEDA are 0.5 point higher than other organizations in the lower forecast, and 1.5 points higher in the higher forecast.

(2) Long-term economic growth in the Philippines

The most recent forecasted results disclosed in May 2003 are indicated by “NEDA High GDP” and “NEDA Low GDP” in the following table.

**Table 3.1 Forecast GDP disclosed by NEDA and modified by DOE**

In %

| | NEDA High GDP | NEDA Low GDP | Modified Low GDP |
|---|---|---|---|
| 2002 | 4.6 | 4.6 | 4.6 |
| 2003 | 5.2 | 4.2 | 4.2 |
| 2004 | 5.8 | 4.9 | 4.9 |
| 2005 | 6.3 | 5.3 | 5.3 |
| 2006 | 6.7 | 5.8 | 5.8 |
| 2007 | 6.3 | 5.3 | 5.3 |
| 2008 | 6.8 | 5.8 | 5.1 |
| 2009 | 7.0 | 6.0 | 5.1 |
| 2010 | 7.0 | 6.0 | 5.1 |
| 2011 | 7.0 | 6.0 | 5.1 |
| 2012 | 7.0 | 6.0 | 5.1 |
| 2013 | 7.0 | 6.0 | 5.1 |
| AAGR(%) | 6.6 | 5.6 | 5.1 |

Qualitatively, the economy of the Philippines has a potential 4-5% growth rate. In addition, if the investment by electronics industries that started in the late 90s continues, the average growth rate of ASEAN countries can be maintained. Economics experts at the Mitsubishi Research Institute expect that a 4.5%- 5.5% growth rate can be maintained in ASEAN countries including the Philippines until 2010. Therefore, in long-term GDP forecasting, especially 10 years' forecasting, by the government of the Philippines may be 1.5 – 2.0 points higher than the results of forecasting by other organizations.

## 3.2 Demand forecasting models

### 3.2.1 Model used in Past PDP

(1) Structure of the Philippine power sector in the past

The structure of the Philippine power sector in the past, as shown in the physical power flow in Fig. 3.10., was that NPC was organization responsible for wholesale, and private distribution companies and corporatives are responsible for retail. Some large customers bought electricity directly from NPC. From the late 90s, NPC-IPP and IPPs, who contracted with distribution companies, appeared in addition to NPC's generation plants. The relation between the transaction contracts is not very different from the physical power flow shown in Fig. 3.10. Thus, it was not difficult to collect actual sales data. Now, NPC is divided into TRANSCO, GENCO and other organizations. In addition, it is in a transient situation in which IPPs increase direct sales to customers.

These structures are changing.

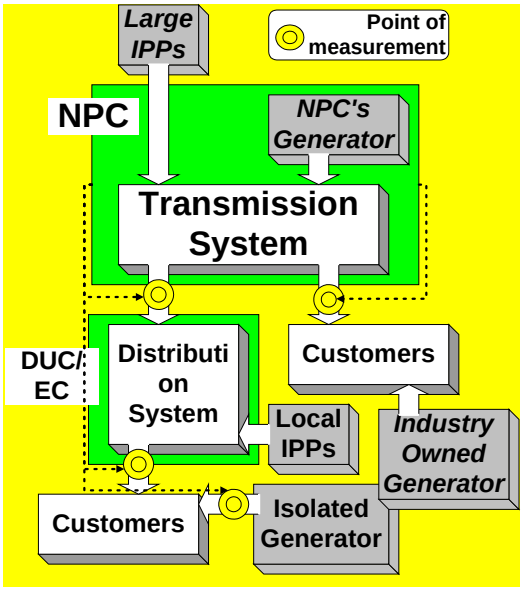



**Fig. 3.3 Structure of the Philippines' power sector in the past**

(2) Forecasting method in PDP 2002-2011 and PDP 2003-2012

In demand forecasting, PDP 2002-2011 and PDP 2003-2012 were established by NPC to access the entire sales data. Tracing past analysis, principally following formulating was adopted through forecasting works.

- Demand forecasting for the main grid was conducted for three major areas , Luzon, the Visayas and Mindanao.
- The forecasting model for Luzon was separated into MERALCO and other companies.

In all cases, these regression models adopted a logarithm of external valuables and target valuables for the regression model. In addition, NPC directly forecasted sales in transmission levels including direct sales to large customers by NPC.

(3) Comment on past demand forecasting results

In PDP 2002-2011, even though DOE adopted a modified GDP scenario based on NEDA's low GDP scenario, and replaced the later five-year growth rate with an average

of the early five-year growth rate, which was still an average elasticity as high as 1.5 - 2.0. The results are sometimes criticized as over estimated. In the work of the Taskforce Project held by METI in Japan in 2001, the Japanese government suggested that Philippine DOE should forecast a more realistic demand and not be too bullish, because the past forecast was too bullish and investors could not trust the results.

However, in PDP 2003-2012, which is published later and is not acknowledged due to little circulation, forecasted demands were greatly adjusted downward. For example, demand in 2011 in Luzon is 20% lower than the PDP 2002-2011 results. In addition, demand in 2011 in the Visayas and Mindanao is 30% lower than the PDP 2002-2011 results. This means that the growth rate was adjusted to 1.2 point lower from 9.5% to 7.3% in Luzon, and the growth rate was lowered from 10 or 12% to nearly 7% in the Visayas and Mindanao.

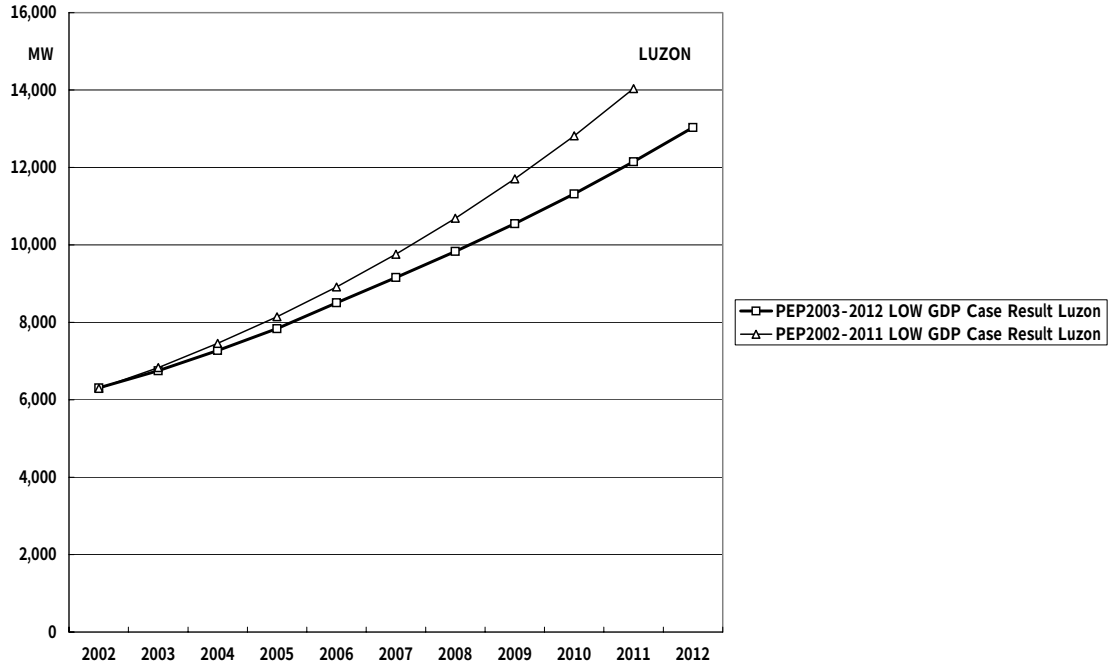



**Fig. 3.5 Difference between PDP 2002-2011 and PDP 2003-2012 in Luzon**

### 3.2.2 Forecasting model in PDP 2004-2013

(1) Overview of forecasting model

- Because it is difficult for NPC to forecast future demand using the past forecasting scheme, a new forecasting scheme based on sales data in the distribution system has

been adopted in this project.
- These sales forecast is performed by regression using the variables of population and GDP-related data with segmentation to the regional level.
- Sales were identified as two categories, i.e., “residential” and “non-residential.”

The main flow of demand forecasting process is shown in Fig. 3.6. In demand forecasting, sales in distribution and the TRANSCO peak demand were used as the estimated variable, and regional GDP and population were used as external explanatory variables. This demand forecasting was performed for the main grids of Luzon, the Visayas and Mindanao (Process I), and was also performed for large islands in the Visayas (Process II).

The next table shows that difference among the forecasting in the past PDP, PDP2004-2013 and idealized and well developed forecasting model in deregulated situation. In the future competitive market, forecasting model also must evaluate market condition using such as end-use forecasting model and price elasticity in drastic market forces.

**Table 3.2 Comparison of demand forecasting models**

| **Model** | **Past PDP** | **PDP2004-2013** | **Idealized and well developed forecasting model** |
|---|---|---|---|
| Implementing agencies | Utilities (NPC) | Government (DOE) | Outsourcing to special organization |
| Forecasting models | Econometric | Econometric | Hybrid (Combination of Econometric and end-use model) |
| Data collection regarding | GDP related indicator, Sales at whole sales and Number of customer | GDP related indicator, Sales at retail and social data such as population | More detail economic indicators, Sale at end-use level, penetration of end-use equipment, data such as number of household or flower space. |
| Competition model | Not considered | Not considered | Including penetration model and price elasticity model. |

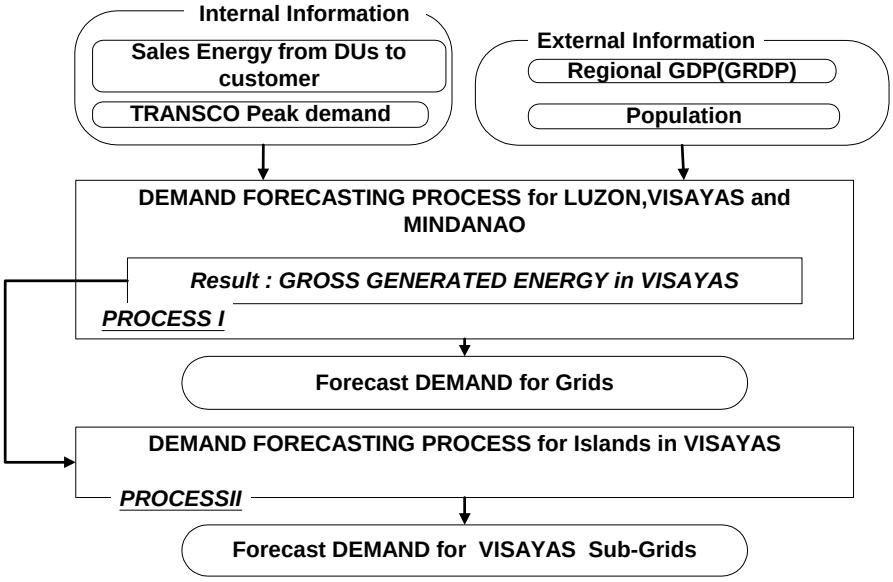



**Fig. 3.6 Overview of the demand forecasting process**

(2) Data collection

The necessary data for demand forecasting were collected as described below.

Population: Both actual and forecasted data were collected from NSO and NSCB.

GDP:

Historical regional and by sector GDP data can be obtained from NSO statistics of each year. Forecasted GDP can be obtained from NEDA. A five-year forecast is officially disclosed to the public, but DOE can obtain a ten-year forecast.

Actual sales in distribution companies:

Historical sales data of PIOUs based on the filing data in ERC. Historical sales data of electric corporations can be obtained from chronicles published by NEA. These sales data were prepared between1990 and 2001.

Peak demand:

Historical peak demand, such as the “TRANSCO Peak” and the “System Peak,” is obtained from Transco. The ratio between sales in distribution and gross generation are determined by referring to data from 1999 to 2001.

(3) Specifics of the demand forecasting method

The flow for the main grids for the process of the demand forecasting method for PDP 2004-2013 is shown in Fig 3.17, and the flow for islands in the Visayas is shown in Fig 3.18. An explanation of each process is as follows.

a) Sales data forecasting at distribution level

Regression formulas by region are created based on the past sales data of distribution companies. The coefficients of these formula are found by a single and a multiple regression process using statistical tools. These analyses are performed for residential and non-residential sectors. The structures of these regression formulas are as follows.

Residential Sector sales = a * population + b* GDP/Capita + c
Non-Residential Sector sales = a* regional GDP

In the first formula, it is assumed that the population and the GDP/Capita are independent of each other.

b) Conversion to sales in the main grid

In the next step, sales on small islands, which are not connected to the main grid, are separated.

c) Conversion to gross generation

The total sales in distribution in each main grid are calculated. These values are then converged to Gross Generated Energy, using the Adjustment Factor (AF), and this explains the past three year' average ratio between Gross Generated Energy and Sales in the distribution system. Gross Generated Energy is calculated from sales data.

Gross Generated Energy = (1+AF) * Sales in distribution

d) Conversion to MW values

Using the "Load Factor," "Gross Generated Energy" is converged to "Peak Demand."

e) Adjustment of the starting point of peak demand growth

At this stage, the starting point for the curve for 2002 is not fitted to actual peak demand in 2002, so the next treatment is conducted to fit the starting point to the actual 2002 peak value and to adjust the growth curve after 2002.

f) Demand forecasting for sub-grids

The method for demand forecasting for sub-grids on islands in the Visayas is almost the same as the method used for the main grids. However, the first step is the distribution of Gross Generated Energy in the Visayas to each area that requires energy on the islands of the Visayas.

g) Preparing the energy requirement for the Generation and Transmission Plan

Using forecasted peak demand (MW), Gross Generated Energy has been re-calculated. This process is necessary for Generation and Transmission planning. This process is basically accomplished using the load factor of each island. However, the total Gross Generated Energy obtained by calculating each island's value will be slightly different from the Gross Generated Energy obtained by forecasting for the main grid of the Visayas. Therefore, there is some adjustment to the load factor to match both values.

## 3.3 Forecasted results and consideration

### 3.3.1 Forecasted results

Demand forecast in PDP 2002-2013 is performed assuming the three GDP scenarios shown below.

- High GDP growth scenario from NEDA
- Low GDP growth scenario from NEDA
- Modified scenario by DOE from a low GDP scenario, by replacing a later five-year growth rate with an average early five-year growth rate

The results for PDP 2004-2013 show a declining trend in GDP elasticity originally. Thus, other results converged from the original results, assuming elasticity will be maintained at the same level as the 2003 level. Finally, six different demand-forecasting results were calculated

for each main grid and sub-grids in the Visayas.

Luzon:

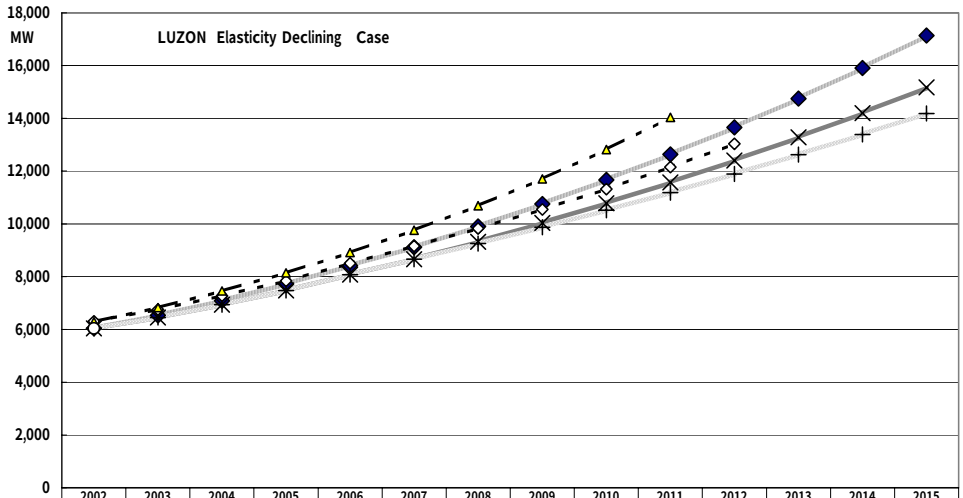
Assuming declining elasticity, three result curves near the PDP 2003-2012 results . Only when there is a high GDP are the results higher than in PDP 2003-2012. If there is constant elasticity, there are three results between the curve in PDP 2002-2011 and in PDP 2003.

Visayas:

When there is declining elasticity, the growth curve is very similar to the results of PDP 2003-2012. When there is constant elasticity, all three curves are between the curve in PDP 2002-2011 and PDP 2003-2012. It seems that the results in PDP 2002-2011 are overestimated, but the results in PDP 2003-2012 are only a little higher, and are reasonable compared with the results in PDP 2004-2013.

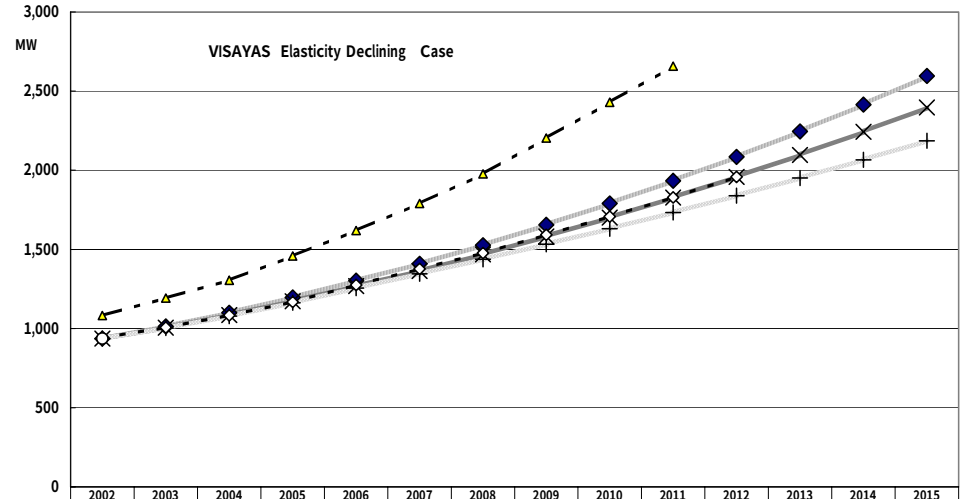
Mindanao:

For forecasted results for Mindanao, the curves are below the PDP 2003-2012 results in all declining elasticity cases. In the case of constant elasticity, low GDP has almost the same curve as the PDP 2003-2012 results. Therefore, the results in PDP 2003-2012, which were modified to be lower than the PDP 2002-2011 results, are still overestimated.



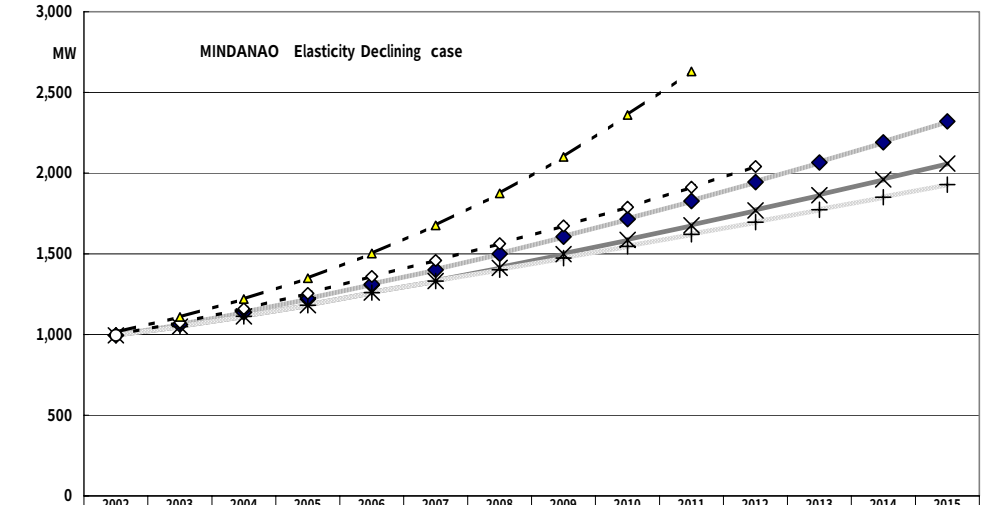

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEDA High GDP CASE Luzon | 6,039 | 6,530 | 7,090 | 7,718 | 8,416 | 9,115 | 9,903 | 10,759 | 11,667 | 12,632 | 13,657 | 14,746 | 15,905 | 17,137 |
| NEDA LOW GDP CASE Luzon | 6,039 | 6,454 | 6,937 | 7,473 | 8,076 | 8,662 | 9,323 | 10,036 | 10,786 | 11,575 | 12,406 | 13,280 | 14,201 | 15,171 |
| LOWER GDP Modified CASE Luzon | 6,039 | 6,454 | 6,937 | 7,473 | 8,076 | 8,662 | 9,255 | 9,872 | 10,517 | 11,189 | 11,890 | 12,622 | 13,387 | 14,186 |
| PEP2003-2012 LOW GDP Case Result Luzon | 6,308 | 6,752 | 7,275 | 7,835 | 8,503 | 9,161 | 9,830 | 10,548 | 11,319 | 12,149 | 13,034 | | | |
| PEP2002-2011 LOW GDP Case Result | 6,293 | 6,830 | 7,458 | 8,143 | 8,915 | 9,762 | 10,689 | 11,705 | 12,816 | 14,038 | | | | |
| Luzon Actual | 6,039 | | | | | | | | | | | | | |

**Fig. 3.7 Demand growth curve in Luzon (declined elasticity)**



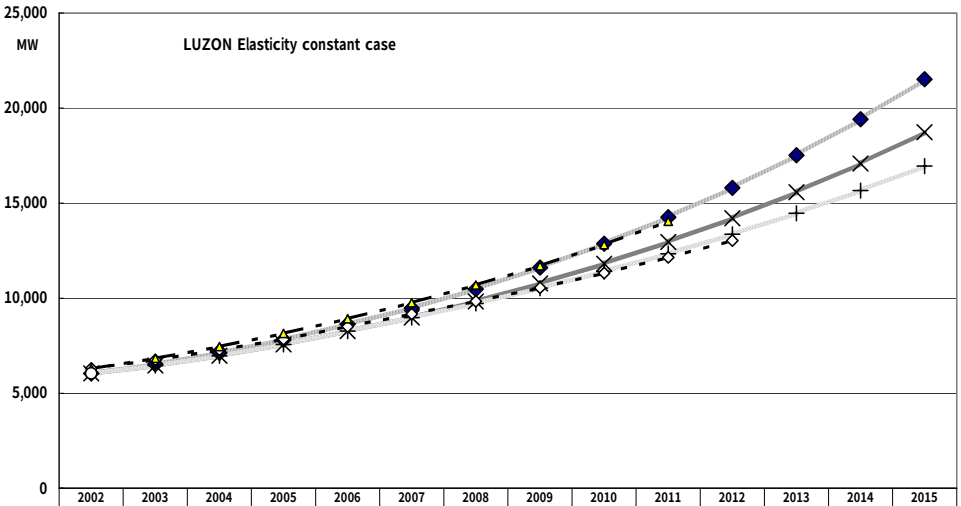

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEDA High GDP CASE Visayas | 936 | 1,013 | 1,100 | 1,197 | 1,302 | 1,409 | 1,527 | 1,655 | 1,790 | 1,933 | 2,085 | 2,245 | 2,415 | 2,596 |
| NEDA LOW GDP CASE Visayas | 936 | 1,006 | 1,085 | 1,172 | 1,269 | 1,363 | 1,469 | 1,582 | 1,702 | 1,827 | 1,959 | 2,097 | 2,243 | 2,397 |
| LOWER GDP Modified CASE Visayas | 936 | 1,003 | 1,079 | 1,163 | 1,256 | 1,346 | 1,438 | 1,532 | 1,631 | 1,733 | 1,840 | 1,950 | 2,066 | 2,186 |
| PEP2003-2012 LOW GDP Case Result Visayas | 941 | 1,007 | 1,084 | 1,168 | 1,276 | 1,377 | 1,477 | 1,592 | 1,707 | 1,829 | 1,958 | | | |
| PEP2002-2011 LOW GDP Case Result | 1,082 | 1,192 | 1,305 | 1,459 | 1,619 | 1,790 | 1,977 | 2,203 | 2,430 | 2,657 | | | | |
| Visayas Actual | 936 | | | | | | | | | | | | | |

**Fig. 3.8 Demand growth curve in the Visayas (declined elasticity)**



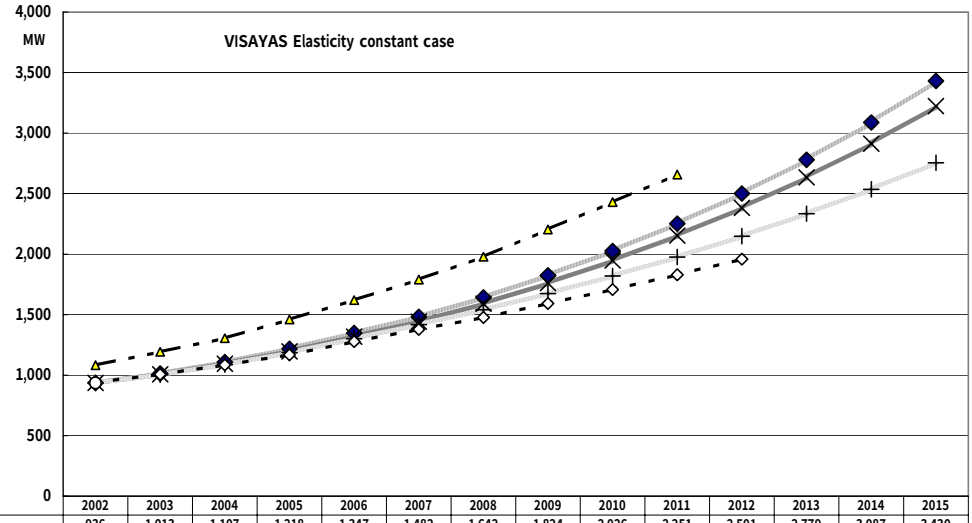

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEDA High GDP CASE Mindanao | 995 | 1,061 | 1,136 | 1,220 | 1,312 | 1,401 | 1,500 | 1,605 | 1,715 | 1,828 | 1,945 | 2,066 | 2,192 | 2,321 |
| NEDA LOW GDP CASE Mindanao | 995 | 1,049 | 1,112 | 1,181 | 1,259 | 1,331 | 1,412 | 1,498 | 1,586 | 1,676 | 1,769 | 1,864 | 1,960 | 2,060 |
| LOWER GDP Modified CASE Mindanao | 995 | 1,049 | 1,112 | 1,181 | 1,259 | 1,331 | 1,402 | 1,474 | 1,547 | 1,621 | 1,696 | 1,773 | 1,850 | 1,929 |
| PEP2003-2012 LOW GDP Case Result Mindanao | 1,000 | 1,074 | 1,159 | 1,254 | 1,360 | 1,459 | 1,563 | 1,673 | 1,789 | 1,912 | 2,041 | | | |
| PEP2002-2011 LOW GDP Case Result | 1,015 | 1,109 | 1,220 | 1,349 | 1,502 | 1,676 | 1,874 | 2,101 | 2,360 | 2,630 | | | | |
| Mindanao Actual | 995 | | | | | | | | | | | | | |

**Fig. 3.9 Demand growth curve in Mindanao (declined elasticity)**



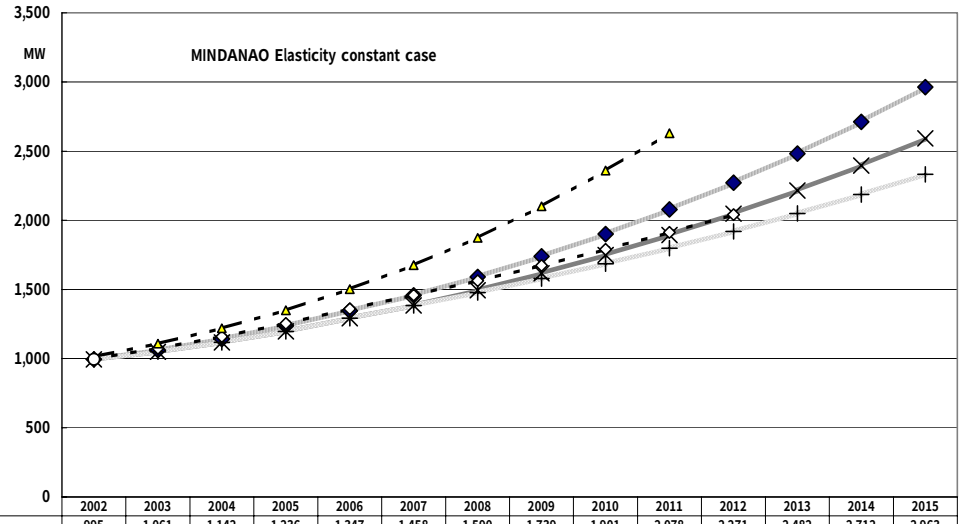

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEDA High GDP CASE Luzon | 6,039 | 6,530 | 7,120 | 7,817 | 8,628 | 9,472 | 10,470 | 11,605 | 12,862 | 14,256 | 15,800 | 17,512 | 19,409 | 21,511 |
| NEDA LOW GDP CASE Luzon | 6,039 | 6,454 | 6,967 | 7,564 | 8,272 | 8,982 | 9,822 | 10,771 | 11,812 | 12,954 | 14,206 | 15,579 | 17,084 | 18,735 |
| LOWER GDP Modified CASE Luzon | 6,039 | 6,454 | 6,967 | 7,564 | 8,272 | 8,982 | 9,724 | 10,527 | 11,397 | 12,339 | 13,358 | 14,462 | 15,656 | 16,949 |
| PEP2003-2012 LOW GDP Case Result Luzon | 6,308 | 6,752 | 7,275 | 7,835 | 8,503 | 9,161 | 9,830 | 10,548 | 11,319 | 12,149 | 13,034 | | | |
| PEP2002-2011 LOW GDP Case Result | 6,293 | 6,830 | 7,458 | 8,143 | 8,915 | 9,762 | 10,689 | 11,705 | 12,816 | 14,038 | | | | |
| Luzon Actual | 6,039 | | | | | | | | | | | | | |

**Fig. 3.10 Demand growth curve in Luzon (constant elasticity)**




| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEDA High GDP CASE Visayas | 936 | 1,013 | 1,107 | 1,218 | 1,347 | 1,482 | 1,642 | 1,824 | 2,026 | 2,251 | 2,501 | 2,779 | 3,087 | 3,430 |
| NEDA LOW GDP CASE Visayas | 936 | 1,006 | 1,093 | 1,196 | 1,319 | 1,442 | 1,591 | 1,759 | 1,946 | 2,153 | 2,381 | 2,634 | 2,914 | 3,223 |
| LOWER GDP Modified CASE Visayas | 936 | 1,003 | 1,086 | 1,184 | 1,301 | 1,418 | 1,541 | 1,674 | 1,819 | 1,976 | 2,148 | 2,334 | 2,536 | 2,755 |
| PEP2003-2012 LOW GDP Case Result Visayas | 941 | 1,007 | 1,084 | 1,168 | 1,276 | 1,377 | 1,477 | 1,592 | 1,707 | 1,829 | 1,958 | | | |
| PEP2002-2011 LOW GDP Case Result | 1,082 | 1,192 | 1,305 | 1,459 | 1,619 | 1,790 | 1,977 | 2,203 | 2,430 | 2,657 | | | | |
| Visayas Actual | 936 | | | | | | | | | | | | | |

**Fig. 3.11 Demand growth curve in the Visayas (constant elasticity)**




| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEDA High GDP CASE Mindanao | 995 | 1,061 | 1,142 | 1,236 | 1,347 | 1,458 | 1,590 | 1,739 | 1,901 | 2,078 | 2,271 | 2,482 | 2,712 | 2,963 |
| NEDA LOW GDP CASE Mindanao | 995 | 1,049 | 1,117 | 1,197 | 1,292 | 1,384 | 1,494 | 1,617 | 1,750 | 1,893 | 2,048 | 2,216 | 2,396 | 2,591 |
| LOWER GDP Modified CASE Mindanao | 995 | 1,049 | 1,117 | 1,197 | 1,292 | 1,384 | 1,478 | 1,578 | 1,685 | 1,799 | 1,920 | 2,049 | 2,186 | 2,333 |
| PEP2003-2012 LOW GDP Case Result Mindanao | 1,000 | 1,074 | 1,159 | 1,254 | 1,360 | 1,459 | 1,563 | 1,673 | 1,789 | 1,912 | 2,041 | | | |
| PEP2002-2011 LOW GDP Case Result | 1,015 | 1,109 | 1,220 | 1,349 | 1,502 | 1,676 | 1,874 | 2,101 | 2,360 | 2,630 | | | | |
| Mindanao Actual | 995 | | | | | | | | | | | | | |

**Fig. 3.12 Demand growth curve in Mindanao (constant elasticity)**

### 3.3.2 Considerations regarding the demand forecasting results

(1) Growth rate

We can see that declined elasticity and the Lower GDP Modified CASE has a similar growth rate to the past average growth rate. Therefore, this curve is the possible lowest growth curve in our forecast.

On the other hand, if the declining trend from the middle of the 90s soon ceases, and GDP growth continues as NEDA estimated, constant elasticity and the NEDA low GDP CASE curve is a possible scenario. Therefore, this curve was recommended as the highest growth curve in our forecast. In this highest case, demand growth in 2013 comes before 1.5 to 2.5 year against declined elasticity and the Lower GDP Modified CASE.

Finally, DOE chose declined elasticity and the NEDA Low GDP CASE, which has a curve near to these two recommended results, as the most likely scenario and the base of the capacity planning. This means that future demand growth will be 0.2 – 1.2 points higher than growth experienced in the past 10 years.

**Table 3.3 Future 10-year-growth rate and the past 10-year-average growth rate**

| | Average Growth Rate of Forecasted Result for 2003-2013 | | | | | | Actual Average Growth Rate for 1992-2002 |
|---|---|---|---|---|---|---|---|
| | Declining Elasticity Case | | | Constant Elasticity Case | | | |
| | NEDA High GDP CASE | NEDA LOW GDP CASE | LOWER GDP Modified CASE | NEDA High GDP CASE | NEDA LOW GDP CASE | LOWER GDP Modified CASE | |
| Luzon | 8.5% | 7.5% | 6.9% | 10.4% | 9.2% | 8.4% | 6.3% |
| Vusayas | 8.3% | 7.6% | 6.9% | 10.6% | 10.1% | 8.8% | 7.1% |
| Mindanao | 6.9% | 5.9% | 5.4% | 8.9% | 7.8% | 6.9% | 5.7% |

The results obtained by forecasting for PDP 2004-2013 are reviewed below.

Luzon:

The results of the growth rate are higher than in the past, with an expected growth rate of 6–9%can be.

Visayas:

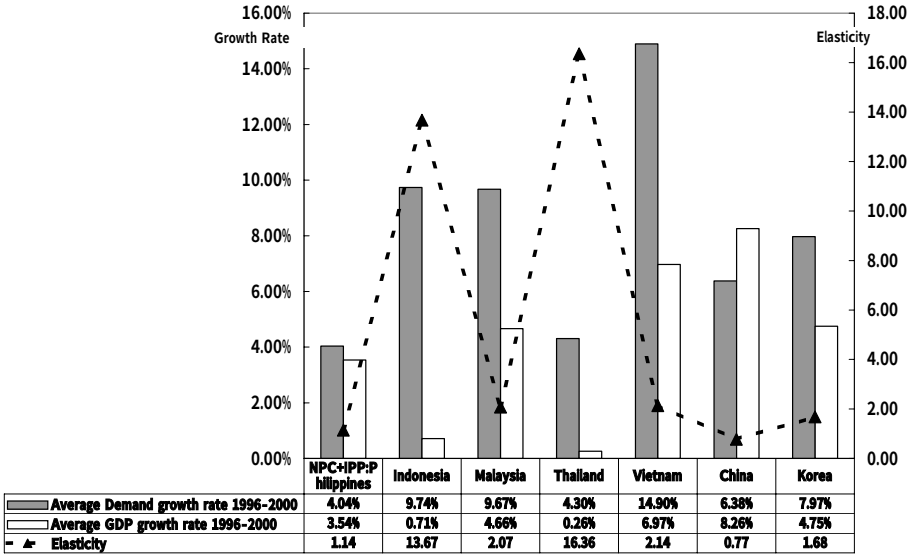
In the next five years, an 8–10% growth rate can also be expected. However, if elasticity declines, the growth rate will be 2.0 points lower than in the previous five years.

Mindanao:

If elasticity declines, the following 10 years' growth rate will be almost 5%, and it is possible that demand is lower than in the Visayas by 2014.

(2) Elasticity

GDP elasticity is considered below. GDP elasticity in the Philippines is relatively lower than in other southeast Asian countries. After the capacity shortage of the early 90s, the Philippines experienced high elasticity, but this declined after the mid 90s.GDP elasticity in the Philippines is said that it is relatively lower than in other Southeast Asian countries (Fig 3.30). Usually, the countries, which experience low GDP growth rate, relatively experienced high elasticity. However, low elasticity in Philippines is thought that share of industrial sector in GDP is relatively lower than other countries.




| | NPC+IPP:Philippines | Indonesia | Malaysia | Thailand | Vietnam | China | Korea |
|---|---|---|---|---|---|---|---|
| Average Demand growth rate 1996-2000 | 4.04% | 9.74% | 9.67% | 4.30% | 14.90% | 6.38% | 7.97% |
| Average GDP growth rate 1996-2000 | 3.54% | 0.71% | 4.66% | 0.26% | 6.97% | 8.26% | 4.75% |
| Elasticity | 1.14 | 13.67 | 2.07 | 16.36 | 2.14 | 0.77 | 1.68 |

**Fig 3.13 Comparison of GDP elasticity**

## 3.4 Issues of future data collection and demand forecasting

(1) Comparison with experience in countries with an advanced liberalization regulation scheme

This section discusses the liberalization problems that will occur in the power sector,

compared with several experiences in USA as an advanced liberalization country.

In USA, the status of liberalization in the power sector is different among states. At the federal level, which is national wide, the Federal Energy Regulatory Commission (FERC) received filing data including a ten-year demand forecast by utilities as the next figure. Based on this data, the Energy Information Agency (EIA), which is an organization in DOE in USA, operates energy and power demand and conducts supply analysis. In fact, the Lawrence Berkeley National Lab. is responsible for forecasting work using a demand-forecasting tool called NEWS.

If we assume that FERC is ERC, DOE in USA is DOE in the Philippines, EIA is a counterpart division in DOE and Lawrence Berkley is the JICA team, the structure shown in Fig. 3.31 is almost the same as in creating PDP 2004-2013 in the Philippines. However, in future, the data collection scheme adopted in PDP 2004-2013 will become more difficult, considering the greater difficulty of data collection from liberalized US utilities.

Moreover, there are no professional organizations such as Lawrence Berkley National Lab. in USA, so inheriting planning technologies may be problematic. Even though there is a budget problem, considering the US experience, external organizations in which DOE is in charge of demand forecasting, should be established.

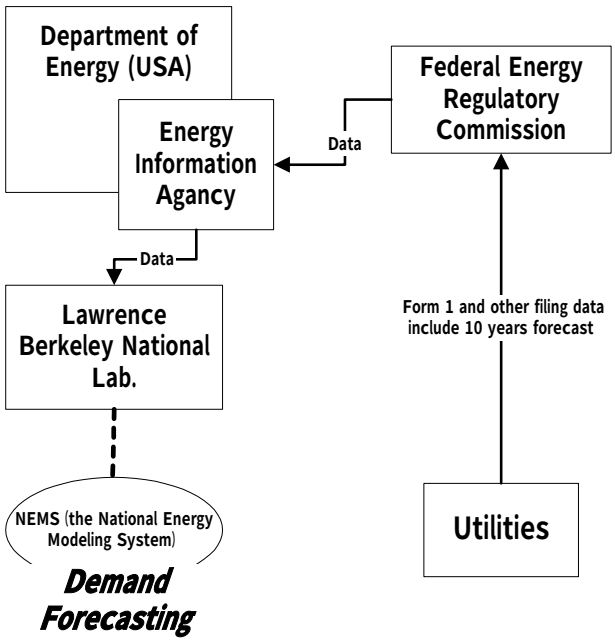



**Fig. 3.14 Demand forecasting scheme at the federal level in USA**

Looking at the difference in planning schemes before and after the liberalization of the power sector in major states in USA, these difference are not uniform among states. In New York State, the New York Power Pool has been reformed to New York ISO in the deregulation process. Therefore, the 20-year planning scheme has not changed after deregulation. On the other hand, California State must estimate future demand by themselves because utilities have refused to submit a 20-year plan to state-regulation bodies since the mid 90s. This is the responsibility of the California Energy Commission.

From these examples, it is more likely that governmental organizations must be more responsible for planning and forecasting compared with before liberalization and deregulation. To understand the actual supply and demand, market operators such as NYISO must contribute. In some cases, it is more important that the regulator forces market participants to submit information on trade.

(2) Considerations due the reform of the power sector in the Philippines

NPC used to be the only organization responsible for wholesale. In addition, NPC could easily collect the retail amount from distribution companies via wholesales relation. However, after liberalization, NPC was divided into TRANSCO and GENCO, making it difficult to understand these organizations and to grasp the wholesale situation of new-coming IPP trade for NPC. By separating transmission and generation, TRANSCO understands the physical power flow, but does not know the name of the seller or buyer. Therefore, TRANSCO principally only understands the transmission peak in each main grid and sub-grid.

In addition, several trade styles are mixed, such as market trading and bilateral contracts, and spot, future and forward transactions are also mixed. Therefore, it is most important that regulator does not double count traded energy, confusing real and virtual trade, by collecting the amount of settled real energy transactions by WESM.

In particular, if TRANSCO is responsible only for planning, operation and maintenance, there will be no organization that recognizes embedded generation at the distribution level. This function used to be partially conducted by NPC. Basically, TRNSCO only understands the “TRANSCO PEAK,” which means the only real peak power flow in the transmission system. Therefore, DOE must directly collect information on embedded generators using the data collection scheme of DDP.

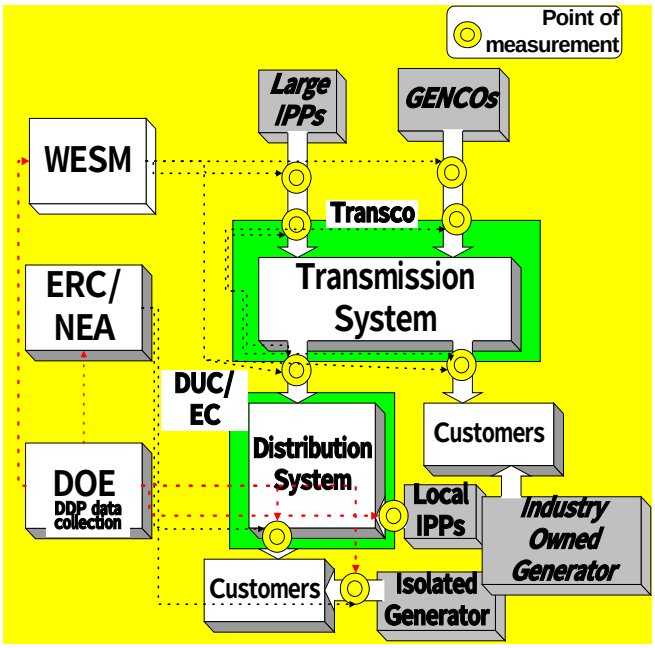



**Fig. 3.15 Structure of physical power flow and its measuring point after liberalization**

(3) Recommendation for the data collection scheme for the next plan

Considering the change in situation in the power sector, a new data collection scheme is needed to conduct the next demand forecast. Therefore, the following works are required.

- Collecting sales and purchases from IPP by DISCOs (PIOUs and ECs) through the DDP scheme

In the first quarter of the following year, DOE should collect actual sales from the previous year and purchase IPPs directly from each DISCO. Sales data are needed to add the latest information to the historical sales database for demand forecasting. Purchase data from IPPs are needed for to find the system peak by adding the supplied capacity from embedded generators to the TRANSCO Peak.

- Collecting real traded energy from WESM

Collecting real traded energy, including bilateral trading on transmission systems is necessary from data records held by WESM in the future after WESM started. These data are important for updating the Adjustment Factor (AF), which is used to convert from forecasted sales data at the distribution level to Gross Generated Energy.

- Collecting peak data from TRANSCO

These peak data are the base of calculation of "System Peak." In works for PDP 2004-2013, TRANSCO could prepare "System Peak" data. However, there is no guarantee that TRANSCO will prepare the same kind of data for the next demand forecasting. Thus, DOE must recognize that TRANSCO, principally, will only prepare the TRANSCO peak , which can be physically measured by TRANSCO.

(4) Recommendation for upgrading of the demand forecasting model

This study ran demand forecasting using multiple regression with population and GDP/capita for the residential sector, and single regression with GDP for the non-residential sector. The issues to update these models are mentioned below.

- Expanding historical sales data

This study could only collect the sales data of DISCOs, which are the most important for demand, for the past 10 years. Usually, for the next ten years of forecasting, at least 20 or 30 years' of data is required. As a countermeasure, PIOUs sales data, for which a lot of data is lacking, should be collected again through the direct access of these companies.

- Upgrading the demand forecasting model

Looking at other macro demand forecasting models in developed countries, some of them have adopted average personal income or the average price of electricity as external variables to create models that are more complex. Moreover, not only macro-econometric models, but also end-use models are combined to establish an advanced forecasting model. There is a requirement in DOE to create this complex model. However, if these complex models are created, several social and economic data are required. But there is still the problem of stocking these data in the Philippines. For example, the development of the most basic data, such as the adopting rate of electric equipment, is needed in the Philippines.

Tools for forecasting such phenomena are not completely developed even in developed countries. This issue should try to be solved after start of WESM operation and stocking enough data of historical price and demand data.

- Analysis of demand structure

In the forecasting method applied in this study, to calculate peak demand, energy was derived using a load factor. Because the load factor used in each grid has not changed significantly over these 10 years, the same load factor is applied to each grid as previous

forecasting. However, in DOE, there is the opinion that the load factor will decrease in future because of the increasing use of air conditioners with economic growth.

To promote these kinds of analysis, applying end-use model based on load survey might be important. In Philippine, implementation of these kinds of survey were not enough in the past, and it is needed that building up experience and results of load survey.

Considering the above-mentioned, the following issues should be taken into account, for updating the model used in PDP2004-2013 and reusing this model in the next demand forecasting works.

- Time horizon of data used in regression process
- Possibility of applying end-use model with more detailed demand structure analysis
- Analysis of demand characteristics, such as price elasticity obtained by observation of historical market price.

## Chapter 4. Power Development Program

### 4.1 Existing Power Plant

**Table 4.1 Installed and Dependable Capacity**

(Unit:MW)

| Type of Plant | Total Philippine | | Luzon | | Visayas | | Mindanao | |
|---|---|---|---|---|---|---|---|---|
| | Installed | Dependable | Installed | Dependable | Installed | Dependable | Installed | Dependable |
| Hydro | 2,530 | 2,225 | 1,535 | 1,342 | 7 | 7 | 987 | 876 |
| Pumpud Storage | 300 | 300 | 300 | 300 | 0 | 0 | 0 | 0 |
| Coal | 3,927 | 3,699 | 3,738 | 3,517 | 189 | 183 | 0 | 0 |
| Oil | 650 | 633 | 650 | 633 | 0 | 0 | 0 | 0 |
| Diesel | 2,003 | 1,713 | 987 | 935 | 458 | 366 | 558 | 412 |
| GT | 675 | 584 | 620 | 529 | 55 | 55 | 0 | 0 |
| Combined Cycle | 2,790 | 2,790 | 2,790 | 2,790 | 0 | 0 | 0 | 0 |
| Geothermal | 1,880 | 1,396 | 856 | 427 | 916 | 860 | 108 | 108 |
| Total | 14,756 | 13,340 | 11,477 | 10,472 | 1,626 | 1,470 | 1,654 | 1,397 |
| *WASP-IV | - | 13,644 | - | 10,666 | - | 1,470 | - | 1,508 |

*WASP-IV = Hydro Install +Thermal Dependable

Source: JICA study team

The difference between installed capacity and dependable capacity is relatively. The reasons are considered as follows:

-The portion of the old diesel unit operated for over 20 years is relatively great.
-Some geothermal power plants have been in maintenance or not in service for long period because of deterioration. (Rehabilitations are planned for a couple of plants.)

Since the constraints of transmission line between Batangas and Manila, power plants located in Batangas( Santa-Rita, San-Lorenzo, Ilijan and Caraca power station) can not be dispatched fully.

## 4.2 Simulation Results

### 4.2.1 Committed Projects

**Table 4.2.1 Committed Projects**

| Plants | Inst. Capacity (MW) | Com. Year | Location |
|---|---|---|---|
| **Luzon** | | | |
| CBK (Kalayaan 3&4) | 350 | 2004 | Laguna |
| PNOC-EDC Wind Power | 40 | 2006 | Ilocos Norte |
| Northwind Power | 25 | 2006 | Ilocos Norte |
| | ***415*** | | |
| **Visayas** | | | |
| Pinamucan transfer from Luzon | 110 | 2004 | Panay |
| Mirant Diesel | 40 | 2004 | Panay |
| Northern Negros Geo | 40 | 2005 | Negros |
| PNOC- Palinpinon Geo | 20 | 2005 | Negros |
| Victorias Bioenergy | 50 | 2005 | Negros |
| | ***260*** | | |
| **Mindanao** | | | |
| Transfer of PB103 & 104 | 64 | 2004 | |
| Mindanao Coal (2 x 100) | 200 | 2006 | Misamis Or. |
| **Total** | ***939*** | | |

Source: DOE

### 4.2.2 Forecasted Demand

Table 4.2.2 shows the specification of demand used in the simulation.

**Table 4.2.2 Simulation Demand (Low_GDP, Declined_Elasticity)**

| | Luzon | Visayas | Visayas Islands (Coincident Peak) | | | | | Mindanao |
|---|---|---|---|---|---|---|---|---|
| | | | Cebu | Panai | Negros | Bohol | Leyte-Samar | |
| 2002 | 6,039 | 936 | 379 | 170 | 184 | 37 | 166 | 995 |
| 2003 | 6,454 | 1,006 | 406 | 182 | 194 | 41 | 182 | 1,049 |
| 2004 | 6,937 | 1,085 | 438 | 196 | 205 | 46 | 200 | 1,112 |
| 2005 | 7,473 | 1,172 | 472 | 212 | 218 | 51 | 220 | 1,181 |
| 2006 | 8,076 | 1,269 | 510 | 229 | 232 | 56 | 242 | 1,259 |
| 2007 | 8,662 | 1,363 | 547 | 246 | 244 | 62 | 264 | 1,331 |
| 2008 | 9,323 | 1,469 | 588 | 264 | 258 | 69 | 289 | 1,412 |
| 2009 | 10,036 | 1,582 | 633 | 284 | 273 | 76 | 317 | 1,498 |
| 2010 | 10,786 | 1,702 | 679 | 305 | 288 | 83 | 346 | 1,586 |
| 2011 | 11,575 | 1,827 | 728 | 327 | 303 | 92 | 378 | 1,676 |
| 2012 | 12,406 | 1,959 | 779 | 350 | 318 | 100 | 411 | 1,769 |
| 2013 | 13,280 | 2,097 | 833 | 374 | 333 | 110 | 447 | 1,864 |
| 2014 | 14,201 | 2,243 | 889 | 400 | 349 | 120 | 486 | 1,960 |
| 2015 | 15,171 | 2,397 | 948 | 426 | 365 | 131 | 527 | 2,060 |
| 2016 | 16,285 | 2,576 | 1,016 | 457 | 384 | 144 | 575 | 2,178 |
| 2017 | 17,480 | 2,770 | 1,089 | 490 | 404 | 159 | 627 | 2,304 |
| 2018 | 18,764 | 2,977 | 1,168 | 525 | 426 | 174 | 685 | 2,436 |
| | 7.3% | 7.5% | 7.3% | 7.3% | 5.4% | 10.1% | 9.3% | 5.8% |

The figures for Luzon, the Visayas and Mindanao are same as the demand explained in Chapter 3. However, for island demand in the Visayas, the coincident peak was prepared and used instead of the non-coincident peak to avoid energy mismatch. The following are the conditions of the coincident peak:

- Portion of each island demand against the total is the same as the non-coincident peak.
- The total of each island demand is the same as the Visayas demand.

Although the PDP (2004-2013) should be prepared for 10 years, the basic simulation is made for 15 years (2004-2018) to avoid the termination effect of dynamic program and to study the necessary infrastructure of fuel.

### 4.2.3 Power Development Plan

(1) Power Development Plan for Luzon

Table 4.2.3 shows the power development plan for Luzon system.

**Table 4.2.3 Power Development Plan (Luzon)**

| Luzon | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Demand | Ex.Cap | Install Cap. | | | | Total | G.R.M |
| | | | GT15 | CC30 | CL30 | Acc | | |
| 2003 | 6,454 | 10667 | | | | 0 | 10667 | 65.3% |
| 2004 | 6,937 | 11017 | | | | 0 | 11017 | 58.8% |
| 2005 | 7,473 | 11017 | | | | 0 | 11017 | 47.4% |
| 2006 | 8,076 | 11020 | | | | 0 | 11020 | 36.4% |
| 2007 | 8,662 | 11020 | | | | 0 | 11020 | 27.2% |
| 2008 | 9,323 | 11020 | 150 | | | 150 | 11170 | 19.8% |
| 2009 | 10,036 | 11020 | 150 | | 600 | 900 | 11920 | 18.8% |
| 2010 | 10,786 | 10387 | 150 | | 1200 | 2250 | 12637 | 17.2% |
| 2011 | 11,575 | 10387 | | | 900 | 3150 | 13537 | 16.9% |
| 2012 | 12,406 | 10387 | 150 | | 600 | 3900 | 14287 | 15.2% |
| 2013 | 13,280 | 10387 | 150 | | 900 | 4950 | 15337 | 15.5% |

Here GT15：Gas Turbine (150**MW**)
CC30：Combined Cycle (300**MW**／Gas)
ＣＬ30：Coal (300**MW**)

The following committed projects are included in the Existing Capacity. Regarding the PNOC and Northwind Power, 5% of their capacity is counted as dependable capacity considering the instability of windmill generation.

- Kalayaan 3&4 350 MW(2004)
- PNOC Wind 40 MW(2006)
- Northwind Power 25 MW(2006)

The necessary indicative is 4,950 MW. Regarding the fuel type, base load power plant (Coal: CL30) and peak load power plant (oil gas turbine: GT15) are planned. Reflecting the high price of natural gas, middle load power plants (combined cycle: CC30) are not planned. The sensitivity of the gas price is studied in the later section.

The reliability index is set at LOLP＝1 day/year. Satisfying the reliability criteria, the generation reserve margin should be more than 15.5 % of the dependable capacity and 21.3% of the installed capacity as below:

Necessary Generation Reserve Margin (in Installed Capacity Base)

-Difference between Installed and Dependable Capacity = 11,477 – 10,666
= 811 MW

- Generation Reserve Margin = (15,337 + 811-13,280) / 13,280
(Installed Capacity Base) = 21.3%

(2) Power Development Plan for the Visayas

Table 4.2.4 shows the power development plan in the Visayas area. The following committed projects are included in the Existing Capacity. Regarding Victorias Bioenergy, 17 MW of 50 MW is counted as supply capacity.

- Pinamucan Transfer from Luzon 110 MW(2004)
- Milant Diesel 40 MW(2004)
- Northern Negros Geothermal 40 MW(2005)
- PINOC Palinpinon Geothermal 20 MW(2005)
- Victorias Bioenergy 50 MW(2006)

The generation reserve margin of the whole Visayas area is more than 50% in 2003. However, regional reserve margin is less than the appropriate level in Panay and the Visayas due to transmission constraints. The necessary capacity calculated by WASP-IV is about 50 MW in each island in 2003; therefore, countermeasures against the expected power deficit should be prepared and carried out as an urgent matter.

On the other hand, the fuel type of the indicative plants is mainly for peak load power plants (Oil Gas Turbine: GT05) and middle load power plants (Diesel: DSL). Base load power plants (Coal: CL05) are planned in 2013. Much of the capacity of current geothermal power plants is considered to contribute to this.

The following is the interconnection development plan considered in this PDP.

- Leyte- Bohol Upgrading 35 ---> 100 MW (2005)
- Leyte-Cebu double circuit 200---> 400 MW (2005)
- Cebu-Negros- Panay double circuit 80 --->160 MW (2005)

The necessities of these projects are described in the section of interconnection.

The same reliability criterion (LOLP = 1 day/year) was also used for the Visayas. Another required by the system operator is that the generation reserve margin should not be lower than 13.2%. The generation reserve margin for Visayas(13.7%) is lower than the reserve

margin in Luzon(15%) since Visayas has minimal Hydro Capacity. Because of the small portion of hydro power plants in installed capacity, hydropower seasonal derating may not affect with the necessary capacity in the Visayas area.

Satisfying the reliability criteria, the generation reserve margin should be more than 13.7 % of the dependable capacity and 21.1% of the installed capacity as follows:

Necessary Generation Reserve Margin (in Installed Capacity Base)

-Difference between Installed and Dependable Capacity

= 1,625 – 1,470 = 155 MW

- Generation Reserve Margin (Installed Capacity Base) = (2,385+ 155 – 2097) / 2,097 = 21.1%

## Table 4.2.4 Power Development Plan (Visayas Area)

| | Leyte-Samar Grid | | | | | | | | Bohol | | | | | | | | | Cebu Grid | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Ex.Cpa | Install | | I.C. | Total | G.R.M | TL | Demand | Ex.Cpa | Install | | | | I.C. | Total | G.R.M | TL | Demand | Ex.Cpa | Install | | | | I.C. | | Total | G.R.M | TL |
| | | | | Acc | Out | | | | | | DS | GT05 | CL05 | acc | | | | | | | DS | GT05 | CL05 | acc | in | out | | | |
| 2003 | 182 | 695 | | 0 | -155 | 540 | 196.7% | 440 | 41 | 49 | | | | 0 | 2 | 52 | 25.0% | 35 | 406 | 427.5 | | | | 0 | 153 | -72 | 508 | 25.0% | 200 |
| 2004 | 200 | 695 | | 0 | -134 | 561 | 180.8% | 440 | 46 | 49 | | | | 0 | 8 | 57 | 25.0% | 35 | 438 | 427.5 | | | | 0 | 126 | -6 | 547 | 25.0% | 200 |
| 2005 | 220 | 695 | | 0 | -184 | 510 | 132.5% | 440 | 51 | 6 | | | | 0 | 57 | 64 | 25.0% | 100 | 472 | 427.5 | | | | 0 | 127 | 36 | 590 | 25.0% | 400 |
| 2006 | 242 | 695 | | 0 | -227 | 468 | 93.5% | 440 | 56 | 6 | | | | 0 | 64 | 71 | 25.0% | 100 | 510 | 427.5 | | | | 0 | 163 | 47 | 637 | 25.0% | 400 |
| 2007 | 264 | 695 | | 0 | -343 | 352 | 33.1% | 440 | 62 | 6 | | | | 0 | 72 | 78 | 25.0% | 100 | 547 | 427.5 | | | | 0 | 271 | -15 | 684 | 25.0% | 400 |
| 2008 | 289 | 695 | | 0 | -355 | 340 | 17.4% | 440 | 69 | 6 | | | | 0 | 75 | 81 | 17.5% | 100 | 588 | 427.5 | | | | 0 | 280 | -17 | 691 | 17.5% | 400 |
| 2009 | 317 | 695 | | 0 | -329 | 365 | 15.3% | 440 | 76 | 6 | | | | 0 | 81 | 87 | 15.4% | 100 | 633 | 427.5 | | 100 | | 100 | 248 | -46 | 730 | 15.4% | 400 |
| 2010 | 346 | 695 | | 0 | -293 | 402 | 16.0% | 440 | 83 | 6 | | 50 | | 50 | 41 | 97 | 16.1% | 100 | 679 | 427.5 | | 50 | | 150 | 252 | -41 | 789 | 16.1% | 400 |
| 2011 | 378 | 695 | | 0 | -264 | 431 | 14.1% | 440 | 92 | 6 | | | | 50 | 48 | 105 | 14.1% | 100 | 728 | 336.7 | | 150 | | 300 | 215 | -21 | 831 | 14.1% | 400 |
| 2012 | 411 | 695 | | 0 | -225 | 469 | 14.1% | 440 | 100 | 6 | | | | 50 | 58 | 115 | 14.1% | 100 | 779 | 336.7 | 50 | | | 350 | 167 | 35 | 889 | 14.1% | 400 |
| 2013 | 447 | 695 | | 0 | -186 | 508 | 13.7% | 440 | 110 | 6 | | | | 50 | 69 | 125 | 13.7% | 100 | 833 | 336.7 | | 50 | | 400 | 117 | 93 | 947 | 13.7% | 400 |

| | Negros | | | | | | | | | | | Panay | | | | | | | | | **Total** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand | Ex.Cap | Install Cap. | | | | I.C. | | Total | G.R.M | TL | Demand | Ex.Cap | Install Cap. | | | | I.C. | Total | G.R.M | TL | Demand | Ex.Cpa | Install | | | | I.C. | | Total | G.R.M |
| | | | DS | GT05 | CL05 | Acc | in | out | | | | | | DS | GT05 | CL05 | Acc | | | | | | | DS | GT05 | CL05 | acc | | | |
| 2003 | 194 | 166 | | 50 | | 50 | 72 | -45 | 242 | 25.0% | 80 | 182 | 132.6 | | 50 | | 50 | 45 | 228 | 25.0% | 80 | 1,006 | 1,470 | | 100 | | 100 | 0 | 1,570 | 56.1% |
| 2004 | 205 | 166 | | | | 50 | 6 | 35 | 257 | 25.0% | 80 | 196 | 230.5 | | | | 50 | -35 | 246 | 25.0% | 80 | 1,085 | 1,567 | | | | 100 | 0 | 1,667 | 53.6% |
| 2005 | 218 | 243 | | | | 50 | -36 | 16 | 273 | 25.0% | 80 | 212 | 230.5 | | | | 50 | -16 | 265 | 25.0% | 80 | 1,172 | 1,602 | | | | 100 | 0 | 1,702 | 45.2% |
| 2006 | 232 | 243 | | | | 50 | -47 | 44 | 290 | 25.0% | 160 | 229 | 230.5 | 50 | | | 100 | -44 | 286 | 25.0% | 160 | 1,269 | 1,602 | 50 | | | 150 | 0 | 1,752 | 38.1% |
| 2007 | 244 | 243 | | | | 50 | 15 | -2 | 306 | 25.0% | 160 | 246 | 204.8 | | | | 100 | 2 | 307 | 25.0% | 160 | 1,363 | 1,576 | | | | 150 | 0 | 1,726 | 26.6% |
| 2008 | 258 | 243 | | | | 50 | 17 | -6 | 304 | 17.5% | 160 | 264 | 204.8 | | | | 100 | 6 | 311 | 17.5% | 160 | 1,469 | 1,576 | | | | 150 | 0 | 1,726 | 17.5% |
| 2009 | 273 | 243 | | | | 50 | 46 | -23 | 315 | 15.4% | 160 | 284 | 204.8 | | | | 100 | 23 | 328 | 15.4% | 160 | 1,582 | 1,576 | | 100 | | 250 | 0 | 1,826 | 15.4% |
| 2010 | 288 | 243 | | | | 50 | 41 | 0 | 334 | 16.1% | 160 | 305 | 204.8 | | 50 | | 150 | 0 | 354 | 16.1% | 160 | 1,702 | 1,576 | | 150 | | 400 | 0 | 1,976 | 16.1% |
| 2011 | 303 | 243 | | | | 50 | 21 | 32 | 346 | 14.1% | 160 | 327 | 204.8 | 50 | | | 200 | -32 | 373 | 14.1% | 160 | 1,827 | 1,485 | 50 | 150 | | 600 | 0 | 2,085 | 14.1% |
| 2012 | 318 | 243 | 50 | | | 100 | -35 | 55 | 363 | 14.1% | 160 | 350 | 204.8 | 50 | | | 250 | -55 | 399 | 14.1% | 160 | 1,959 | 1,485 | 150 | | | 750 | 0 | 2,235 | 14.1% |
| 2013 | 333 | 243 | 50 | | | 150 | -93 | 79 | 379 | 13.7% | 160 | 374 | 204.8 | | | 50 | 300 | -79 | 426 | 13.7% | 160 | 2,097 | 1,485 | 50 | 50 | 50 | 900 | 0 | 2,385 | 13.7% |

**Here** **DS**:**Diesel** (**50MW**)
**GT05**:**Gas Turbine** (**50MW**/**Oil**)
**CL05**:**Coal** (**50MW**)

**Fig. 4.2.1 Regional Supply –Demand Balance in the Visayas Area in 2006**

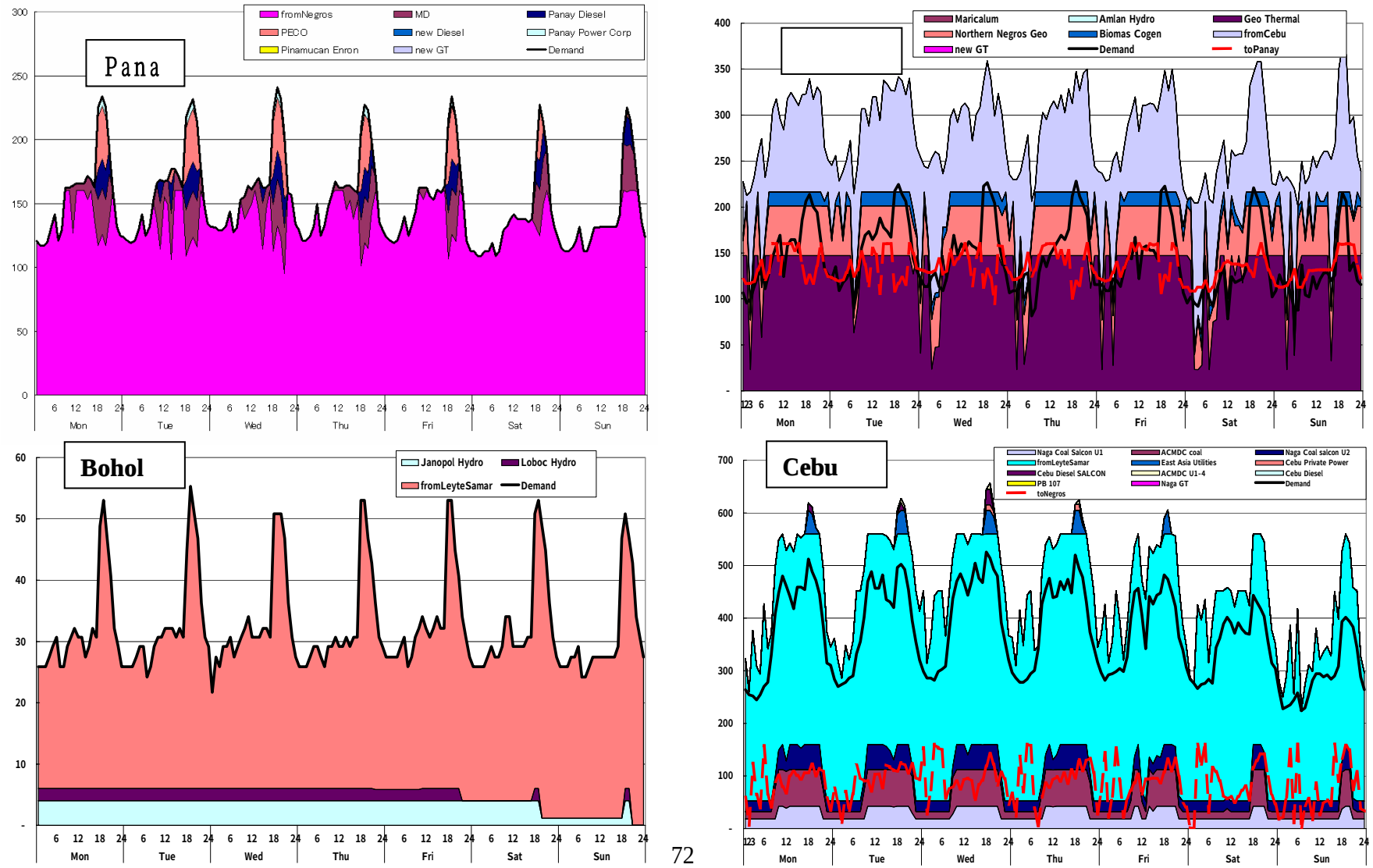


Figure 4.2.1 shows the regional demand-supply balance of the Visayas area. By realizing PDP (2004-2013), stable power demand-supply will be guaranteed even in Panay and Negros Island. In Bohol and Cebu Islands, most of the power will be supplied from the cheaper geothermal power plant of Leyte-Samar. Figure 4.2.2 shows the demand-supply balance in Leyte- Samar. Surplus geothermal power will be supplied to Cebu, Bohol and Luzon.

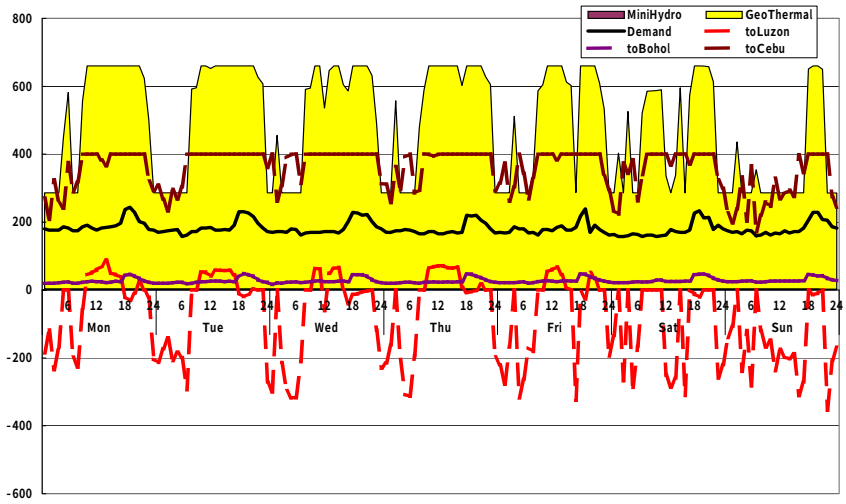



**Fig. 4.2.2 Demand Supply in Leyte-Samar in 2006**

Figure 4.2.3 shows the interconnection power flow between islands. Regarding the Leyte-Cebu interconnection, the power flows at almost its limit despite the upgrading of the Leyte-Cebu interconnection.

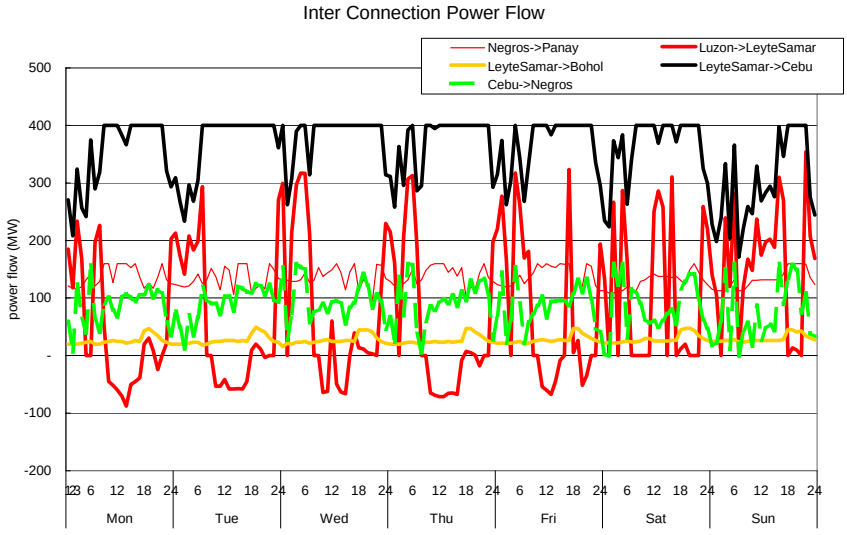



**Fig. 4.2.3 Interconnection Power Flow in 2006**

Table 4.2.5 shows the power development plan in Mindanao.

**Table 4.2.5 Power Development plan in Mindanao**

| Mindanao | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Demand | Ex.Cap | Install Cap. | | | | Total | G.R.M |
| | | | DS | GT05 | CL05 | Acc | | |
| 2003 | 1,049 | 1509 | | | | 0 | 1509 | 43.9% |
| 2004 | 1,112 | 1561 | | | | 0 | 1561 | 40.4% |
| 2005 | 1,181 | 1561 | | 50 | | 50 | 1611 | 36.4% |
| 2006 | 1,259 | 1761 | | | | 50 | 1811 | 43.9% |
| 2007 | 1,331 | 1761 | | | | 50 | 1811 | 36.0% |
| 2008 | 1,412 | 1761 | | | | 50 | 1811 | 28.2% |
| 2009 | 1,498 | 1709 | | 100 | 50 | 200 | 1909 | 27.4% |
| 2010 | 1,586 | 1709 | | | 100 | 300 | 2009 | 26.7% |
| 2011 | 1,676 | 1709 | | | 50 | 350 | 2059 | 22.8% |
| 2012 | 1,769 | 1709 | | | 100 | 450 | 2159 | 22.1% |
| 2013 | 1,864 | 1709 | | 50 | 50 | 550 | 2259 | 21.2% |

**Here** **DS**：**Diesel**（**50MW**）
**GT05**：**Gas Turbine**（**50MW/Oil**）
**CL05**:**Coal**（**50MW**）

The following projects are included in the existing capacity.

- PB103,104 Transfer 52 MW (Dependable) / 64 MW (Install) (2004)
- Mindanao Coal 200 MW（2006）

From the economical viewpoints, base load power plants (CL05) and peak load power plants (GT05) are required for the next ten years; however, middle load power plants (DSL) are not planned. Much of the capacity of current diesel power plants may contribute to installing base and peak load power plants for least cost power development.

The same reliability criterion (LOLP = 1 day/year) was also used for the Mindanao. However, the generation reserve margin in Mindanao is relatively higher than those in Luzon and the Visayas. This is attributed to the large amount of hydropower capacity in Mindanao where seasonal derating should be considered.

Satisfying the reliability criteria, the generation reserve margin should be more than more than 21.2 % of the dependable capacity 29% of the installed capacity.

Necessary Generation Reserve Margin (in Installed Capacity Base)

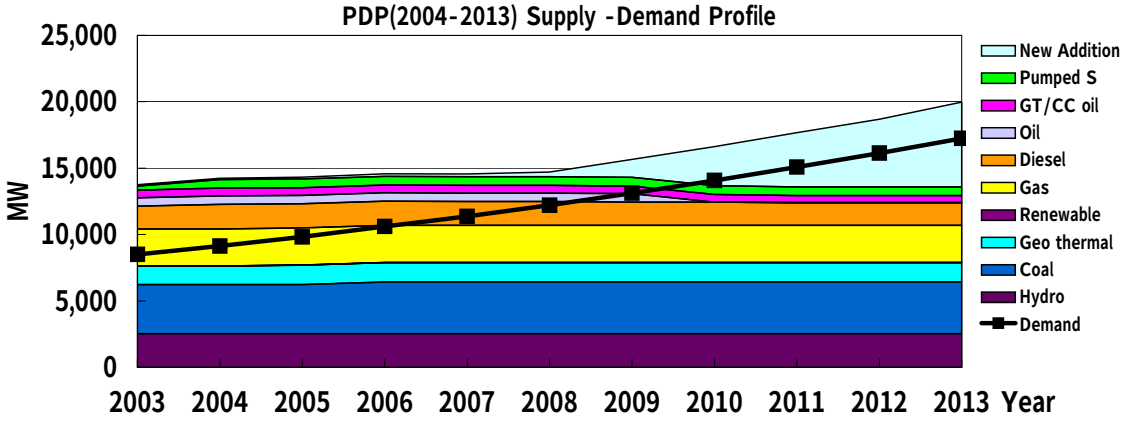
-Difference between Installed and Dependable Capacity

= 1,654 – 1,509 = 145 MW

- Generation Reserve Margin = (2,259 + 145 – 1,864) / 1,864
  (Installed Capacity Base) = 29.0%

### 4.2.4 Necessary Capacity Addition

Figure 4.2.4 shows the kW balance of PDP (2004-2013). Necessary capacity addition will be about 6400 MW in total.




(Unit:MW)

| Year | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Demand | 8,508 | 9,134 | 9,827 | 10,604 | 11,357 | 12,204 | 13,117 | 14,074 | 15,079 | 16,133 | 17,241 |
| Total Supply | 13,746 | 14,246 | 14,330 | 14,583 | 14,557 | 14,707 | 15,655 | 16,622 | 17,681 | 18,681 | 19,981 |
| New Addition | 100 | 100 | 150 | 200 | 200 | 350 | 1,350 | 2,950 | 4,100 | 5,100 | 6,400 |
| Hydro | 2,529 | 2,529 | 2,529 | 2,529 | 2,529 | 2,529 | 2,529 | 2,529 | 2,529 | 2,529 | 2,529 |
| Pumped S | 300 | 650 | 650 | 650 | 650 | 650 | 650 | 650 | 650 | 650 | 650 |
| Coal | 3,700 | 3,700 | 3,700 | 3,900 | 3,900 | 3,900 | 3,900 | 3,900 | 3,900 | 3,900 | 3,900 |
| Oil | 633 | 633 | 633 | 633 | 633 | 633 | 633 | 0 | 0 | 0 | 0 |
| Diesel | 1,714 | 1,864 | 1,821 | 1,821 | 1,795 | 1,795 | 1,743 | 1,743 | 1,707 | 1,707 | 1,707 |
| GT/CC oil | 584 | 584 | 584 | 584 | 584 | 584 | 584 | 584 | 529 | 529 | 529 |
| Gas | 2,790 | 2,790 | 2,790 | 2,790 | 2,790 | 2,790 | 2,790 | 2,790 | 2,790 | 2,790 | 2,790 |
| Geo thermal | 1,396 | 1,396 | 1,456 | 1,456 | 1,456 | 1,456 | 1,456 | 1,456 | 1,456 | 1,456 | 1,456 |
| Renewable | 0 | 0 | 17 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Reserve Mergine | 61.6% | 56.0% | 45.8% | 37.5% | 28.2% | 20.5% | 19.4% | 18.1% | 17.3% | 15.8% | 15.9% |

**Fig. 4.2.4 kWh balance of the total Philippines (PDP (2004-2013))**

## 4.3 Technical Issues

### 4.3.1 Fuel Price

In order to enhance the effective use of natural gas, the impact of gas price on the optimal power development plan is studied. The result says if the gas price can be discounted to 80%-90% of current price, the gas-fired combined cycle power plant is more competitive than other fuel plants. Therefore, continuous efforts to reduce the natural gas price must be conducted, for example, constructing the necessary infrastructure under governmental initiative.

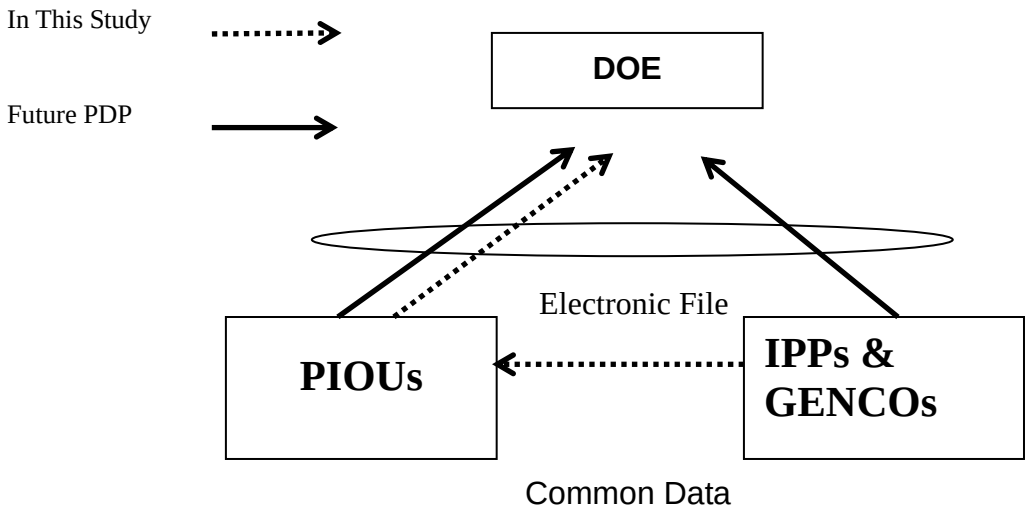
### 4.3.2 Interconnection Issues

The necessity of Cebu-Negros-Panay and Leyte-Cebu interconnection is studied. If the power development including the optimal siting goes well, there is no necessity for reinforcement of the interconnection. However, it may not be constructed, start operating in the necessary year, or be in the optimal location because of regional issues, fuel availability, etc. Therefore, these issues should be determined with the policy.

## 4.4 Technical Issues for Preparation of the PDP

### 4.4.1 Data Gathering System

The JICA study team conducted to collect the necessary data for the PDP (2004-2013) by distributing a questionnaire to the related organizations. Considering this, the data gathering system must be established and confirmed again for the PDP (2004-2013). The outline of the data gathering system is shown in Fig. 4.4.1




Common Data

- Generation Facility Data for the Power Supply Plan

**As a Part of DDP (for PIOUs)**

- Demand and Supply data for demand forecasting
- Name of facilities contributing to the power system

**Fig 4.4.1 Data Gathering system**

### 4.4.2 Schedule of the PDP Preparation (Preliminary Study)

-The GDP forecast is released in June by NEDA. Consequently, the demand forecasting cannot help confirming behind the schedule.

-In addition to delaying the demand confirmation, the demand was modified twice in the preparation work of PDP (2004-2012).

- The reason is considered to be that the approval system for the demand / power development plan was not clarified officially.

- Considering the above, preliminary studies should be thoroughly conducted for the

PDP (2005-2014) for drawing an output image of the PDP.

### 4.4.3 Training system in the DOE

-Limited to the Power Development Plan, the capacity of the person in charge is relatively at high level except for their little experience. Therefore, the DOE can conduct the basic study of PDP by themselves.

- However, most of the preparation work is made by a couple of staff members so that understaffing is severe problem.
- This issue may be relived by dispatching additional staff for PDP preparation.
- To acquire knowledge for preparing the PDP, such as demand forecasting and the power supply plan, experience and training through actual preparation (OJT) is effective. However, these technologies are a kind of classical technology, except for spot market issues.

Therefore, systematic training may be useful in nurturing the person in charge by using the general materials in addition to the OJT.

## 4.5 Integration with subordinate programs

- TDP: Integration and coordination of all projects

All power development projects and transmission projects newly planned should be integrated.

- DDP: Data integration

DDP may be used as an data gathering tool. The necessary data for preparing the PDP, such as demand in each franchise data and facility data, are collected as a part of DDP and reflected in the PDP.

- MEDP: Integration of document

The PDP, which is the national grid plan, differs from the MEDP, which is the energized plan for the un-energized plan, too much to integrate the both data and contents.

Ideally, the MEDP should be considered in the simulation exercises in the preparation of the PDP. However, process flow and methodology has yet to be established for this purpose.

Therefore, the integration may be conducted only on documentation. In future, the effective grid extension methodology may be integrated.

## 5. Transmission Development Plan

### 5.1 Situation of TDP preparation by TRANSCO

Under the Electric Power Industry Restructuring Act (EPIRA), which was enacted in June 2001, TDP 2003 was submitted by TRANSCO to DOE in September 2002. However, the TDP was revised by a consulting company who had a contract with PSALM, which considers TRANSCO's sales. The TDP was then submitted again and officially approved by DOE in March 2003.

On the other hand, TDP 2004 was delayed, because of the delay in the demand forecast and power development planning by DOE. PEP was also delayed and was not submitted to Congress by September 15.

### 5.2 Criteria for TDP preparation

TRANSCO applies the N-1 rule for TDP preparation to comply with the Grid Code. This means that the power flows of the transmission lines and the transformers are under rated capacity in their normal condition, and that there are no interruptions or continuous blackouts in the case of the failure of one generator, transmission circuit or transformer.

Meanwhile, in the case of multiple failures, voltage collapse and cascaded outages are not allowed, although load shedding and generation shedding are accepted.

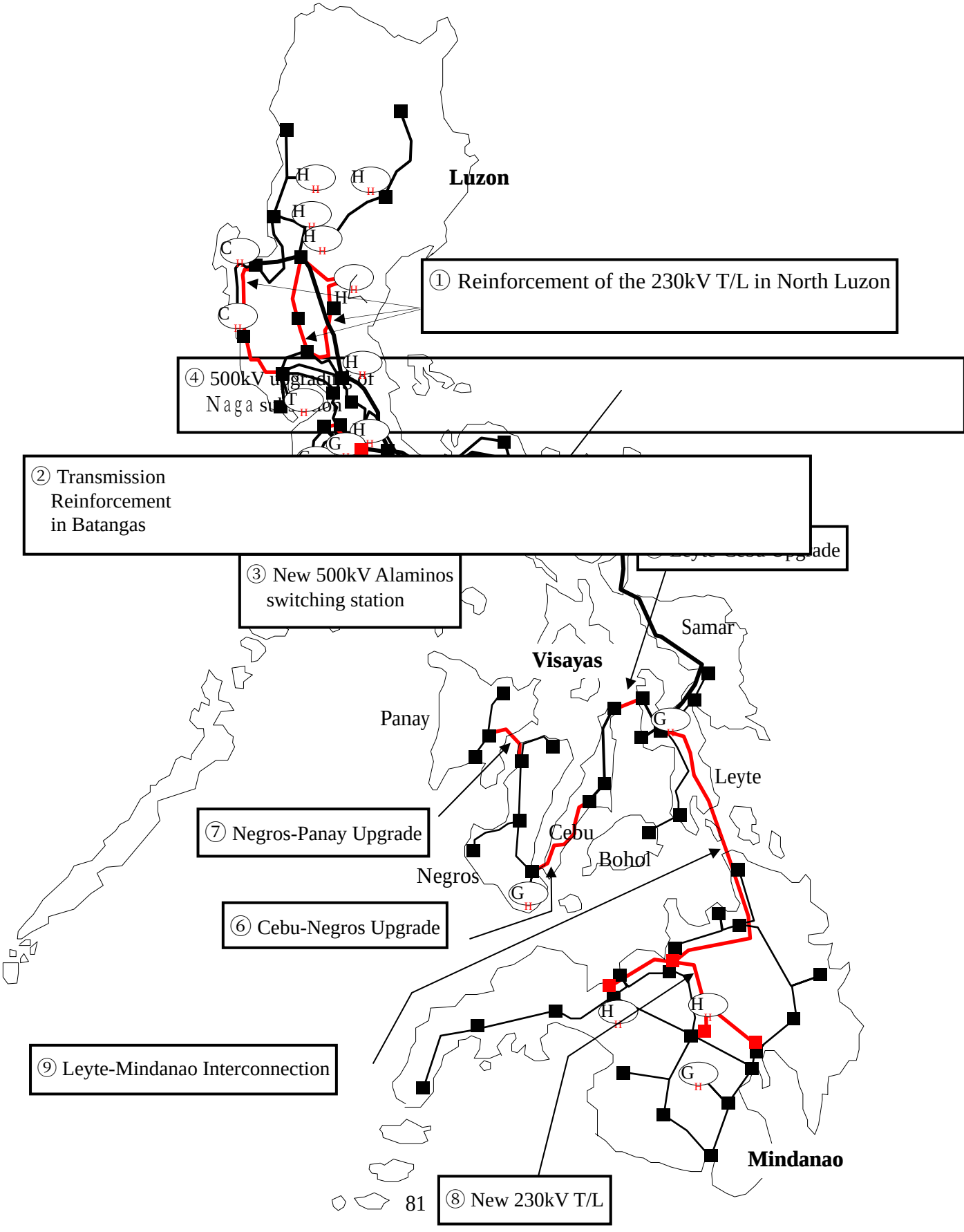
## 5.3 Main Transmission Projects

Table 5.1 shows the main transmission projects in the Philippines and the review results.

**Table 5.1: Main Transmission Projects and Review Results**

| | Projects | Review Results |
|---|---|---|
| Luzon Grid | ① Reinforcement of the 230kV Transmission Lines in North Luzon | It is economical to reinforce the three 230kV transmission lines in accordance with power development in North Luzon. |
| | ② Transmission Reinforcement in Batangas | The result is the same as TDP 2003. |
| | ③ New 500kV Alaminos switching station | It is desirable to defer the project. |
| | ④ 500kV upgrading of Naga substation | It is desirable to defer the project. |
| Visayas Grid | ⑤ Leyte-Cebu Upgrade | The result is the same as TDP 2003. |
| | ⑥ Cebu-Negros Upgrade | It is desirable to promote the projects against power crises in Panay, although they are not economical. |
| | ⑦ Negros-Panay Upgrade | |
| Mindanao Grid | ⑧ New 230kV Transmission Lines | It depends on power development in South Mindanao and exclusion of the transmission line frequently destroyed by terrorist. |
| | ⑨ Leyte-Mindanao Interconnection | Although it is not economical, following items also should be considered for decision.<br>- Reduction in reserve margin<br>- Reliability<br>- Risk hedge against delay in power development or unexpected demand increase<br>- Impact on transmission charges<br>- Merit for spot market |

**Fig 5.1: Main Transmission Projects**



## 5.4 Issues and Recommendations regarding TDP

### 5.4.1 Organization for TDP Evaluation

The Power Planning & Development Division in the Electric Power Industry Management Bureau (EPIMB) is responsible for evaluating and approving TDP, and integration of TDP to PDP.

Currently, only one staff member is assigned to the TDP section, although the assignment of four staff members is planned.

The TDP staff covers a lot of work, such as TDP evaluation (including checking the contents and system analysis using PSS/E), planning interconnections (mainly using GTMax), integrating TDP to PDP and PEP (documentation and so on), public consultation, coping with individual problems (such as power crises in Panay and system planning for Mindoro), coordination with staff in charge of demand forecasting and power development. Therefore, the staff is overworked, and the technical knowledge and skill will not be transferred to the other staff in DOE.

In addition, the staff is also in charge of not only TDP but also DDP. Therefore, the number of staff responsible for TDP should be increased, and staff responsible for DDP should be assigned as soon as possible.

### 5.4.2 Schedule

In TDP preparation, DOE first makes demand forecasts and power development. TRANSCO then prepares TDP based on the demand forecast and power development, and submits it to DOE. After this, DOE evaluates and approves TDP and integrates it to PDP and PEP. Therefore, the schedule was expected to be very tight.

For this reason, we planned to evaluate the individual projects based on the previous TDP (TDP2003), and planned to evaluate this year's TDP by checking the points changed from the previous TDP.

According to the original schedule, DOE was to finalize the demand forecast at the end of May, and finalize the power development plan by the third week in June. TRANSCO was to submit TDP in the middle of July. Then, DOE was to evaluate and approve it, and integrate it to PDP and PEP. PEP was to be submitted to Congress by September 15.

However, in fact, the timing of the finalization of demand forecast was the middle of July, and DOE revised it at the beginning of September. Therefore, TDP preparation by TRANSCO was greatly delayed. As a result, PEP was not submitted to Congress by September 15.

Considering this year's actual schedule, next year, the demand forecast should be finalized at the end of May, the power development plan should be finalized in the middle of June, and TRANSCO needs to submit TDP to DOE in the middle of July.

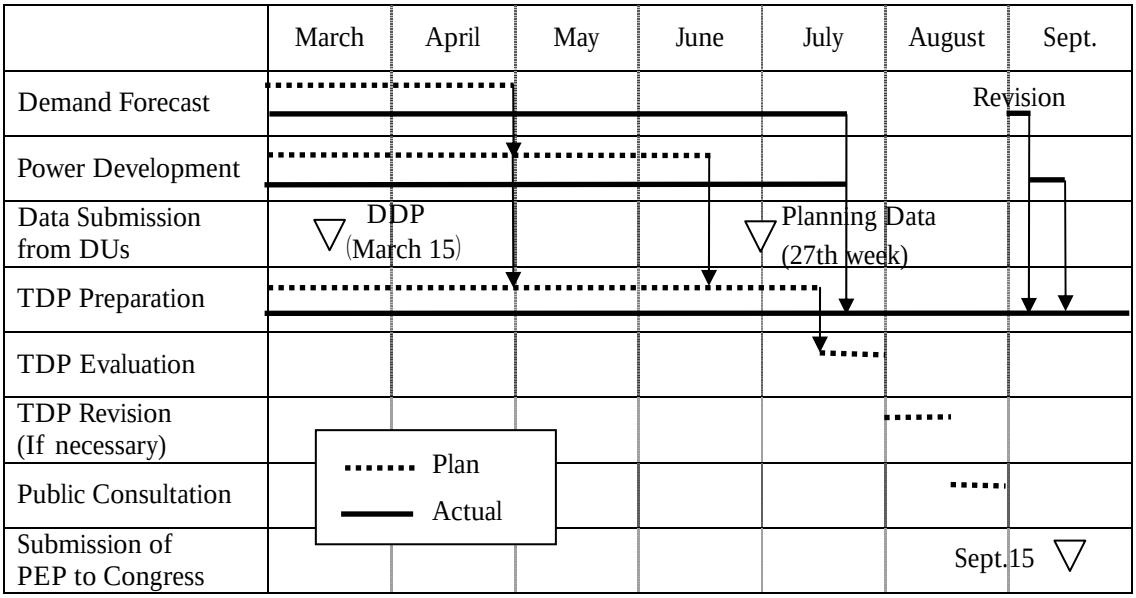
Meanwhile, all grid users including distribution utilities, need to submit planning data to TRANSCO annually for five succeeding years by calendar Week 27 of the current year (July) under Grid Code 6.2.2.2.

However, the timing is too late, considering the TDP preparation schedule. Therefore, the data needs to be submitted earlier.

As the distribution utilities need to submit DDP to DOE by March 15 under Rule 7. Section4 (P), they can submit the planning data to TRANSCO at this time.

Therefore, TRANSCO needs to make efforts to collect the planning data for TDP preparation before calendar Week 27, and grid users, including distribution utilities, need to cooperate with TRANSCO regarding the early submission of the data.

**Table 5.2: Schedule for TDP preparation and evaluation (in 2003)**



### 5.4.3 Coordination with the Power Development Plan

As transmission development planning is closely related to power development planning, it is impossible to make transmission development plan independently.

For measures to accommodate demand increase in an area, there are two options: one is power development in the area, and the other is transmission expansion.

Therefore, DOE and TRANSCO need to cooperate and decide which option should be taken.

Concretely, DOE needs to provide data on committed power development projects for TRANSCO to prepare TDP. In addition, DOE needs to provide data on indicative projects that should be included in TDP from a political viewpoint, considering the possibility of the projects. The data to be provided from DOE to TRANSCO are the location of the site, fuel type, capacity, year of commissioning and so on.

DOE needs to judge desirable locations for power development from a transmission viewpoint based on the information from TRANSCO, and utilize the information for power development promotion.

On the other hand, TRANSCO needs to apply the power development plan provided by DOE to TDP. Regarding indicative projects, TRANSCO assumes locations and capacities based on the information that TRANSCO receives directly from IPPs, considering the ideal transmission system in the future.

Information also needs to be submitted to DOE on the indicative projects that TRANSCO assumes for TDP preparation, and this needs to be evaluated by DOE.

To coordinate the power development plan and transmission development plan, exchanging of a lot of data and feedback of the results of the study are necessary between DOE and TRANSCO. Therefore, holding periodic meetings and clarifying contact persons is necessary during TDP preparation. Generating companies, such as NPC and IPPs, and distribution utilities, such as MERALCO, needs to attend the meetings, if necessary.

In addition, it is desirable that DOE and TRANSCO discuss the interconnection plan in the meeting as coordination is also necessary between DOE and TRANSCO (in some cases with the generating companies and the distribution companies).

### 5.4.4 Planning Interconnection between Islands

Planning interconnection between islands needs to be evaluated considering which option is desirable for reliability, economics, environment, site possibility and so on.

Before the privatization of NPC, NPC was responsible for the power development plan, the transmission development plan and construction of power plants and transmission lines.

Therefore, NPC coordinated the power development plan and the transmission development plan inside the organization.

Now, NPC is divided and TRANSCO is only responsible for transmission planning. Therefore, coordination between TRANSCO and DOE, which is responsible for power development, is necessary.

A lot of work is necessary to plan interconnection, such as demand forecasting for each island, power development for each island, and power flow analysis if there is an existing interconnection.

Table 5.2 shows the roles of DOE and TRANSCO regarding interconnection.

**Table 5.2: Roles of the DOE and TRANSCO regarding Interconnection**

| DOE | TRANSCO |
|---|---|
| - Demand Forecast (each island)<br>- Power Development (each island)<br>- Economic analysis (GTMax)<br>- Policy Making<br>- Planning measures in case of delay in power development | - Power Flow Analysis (PSS/E)<br>- Feasibility Study<br>- Schedule<br>- Cost<br>- Reliability Check (N-1 rule) |

Now, power development implementation should be private sector led while DOE provides the indicative power development plan.

It is therefore possible that power development is delayed or canceled. In this case, DOE needs to make a plan to cope with the situation.

For the schedule for interconnection planning, as the schedule for TDP preparation is very tight, the study on interconnection should be conducted in advance independently of TDP preparation.

# Chapter 6 Rural Electrification Plan

## 6.1 Assessment of the O-I LAW Program

### 6.1.1 Outline of the O-I LAW Program

The objective of the O-I LAW Program is to electrify 100% of 41,995 barangays by 2006. The components of the O-I LAW Program are as follows.

1) Program by governmental agencies
   DOE
      Locally funded project using new and renewable energy
      Grant in Aids Program Project
      Project under the ER1-94 fund
   Project by NEA/ECs
   Island electrification by NPC
   Environmental Improvement for Economic Sustainability Project by PNOC
   Community Relations Project by PNOC-EDC
   DAR (Department of Agrarian Reform)
      (Solar Power Technology Support (SPOTS) Project) for Agrarian Reform Communities
2) Project by PIOUs such as MERALCO
3) Project by LGUs
4) Project by IPPs

These projects are implemented through grid extension and the utilization of new and renewable energy. Grid extension is implemented by NEA/ECs and PIOUs/LGUs. On the other hand, DOE and NPC-SPUG implement off-grid electrification by introducing individual power systems such as SHS, BCS, micro-hydro and wind power systems.

### 6.1.2 O-I LAW Program implementation step for rural electrification

Since the O-I LAW team started, the condition of barangay electrification by Dec 2002 is shown in Table 6.1. According to this table, as of the end of 2002, 5,409 barangays are still unenergized.

**Table 6.1 O-I LAW Program implementation step**

| Year | Target Number of Electrified Barangays | Actual Number of Electrified Barangays | Cumulative Number of Electrified Barangays | Remaining Number of Electrified Barangays | Electrified Barangay Level (%) |
|---|---|---|---|---|---|
| 1999 | 900 | 755 | 32,281 | 9,718 | 76.9 |
| 2000 | 1,621 | 1,366 | 33,647 | 8,352 | 80.1 |
| 2001 | 1,353 | 1,244 | 34,891 | 7,103 | 83.1 |
| 2002 | 1,636 | 1,699 | 36,590 | 5,409 | 87.1 |

as of December 2002

Source: O-I LAW Program Team Terminal Report

## 6.2 Frame of rural electrification plan

### 6.2.1 Constitution of the rural electrification plan

Currently, the rural electrification plan has big components, which are MEDP (Missionary Electrification Development Plan) and DDP (Distribution Development Plan). MEDP includes the management of SPUG, SPUG's existing facility operations and installation of individual power systems. DDP includes the management of the existing grid network and electrification through grid extension by NEA/ECs and PIOUs.

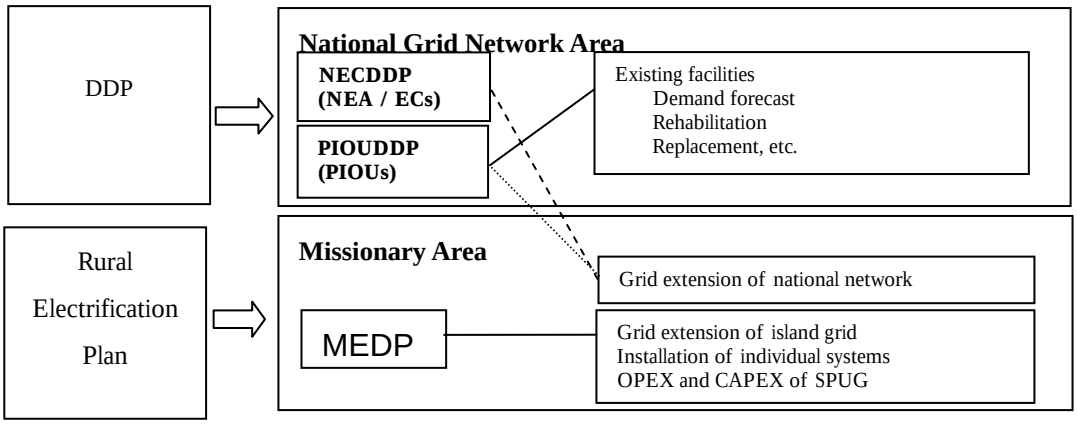



**Fig. 6.1 Constitution of rural electrification plan**

### 6.2.2 Workflow to prepare rural electrification plan

This MEDP is a five-year electrification plan from 2004 to 2008. For the promotion of rural electrification during the timeframe, the first target is to achieve 100% barangay electrification by 2006 and prepare a plan to achieve this target. After completion, future electrification promotion will be highlighted and studied. Rural electrification promotes both

grid extension and the introduction of individual systems. Therefore, MEDP needs to oversee both project plans. Based on these issues, the following concept for rural electrification plan is proposed by the study team to prepare a more practical plan. Workflow to prepare the rural electrification plan is shown in the Fig. 6.2.

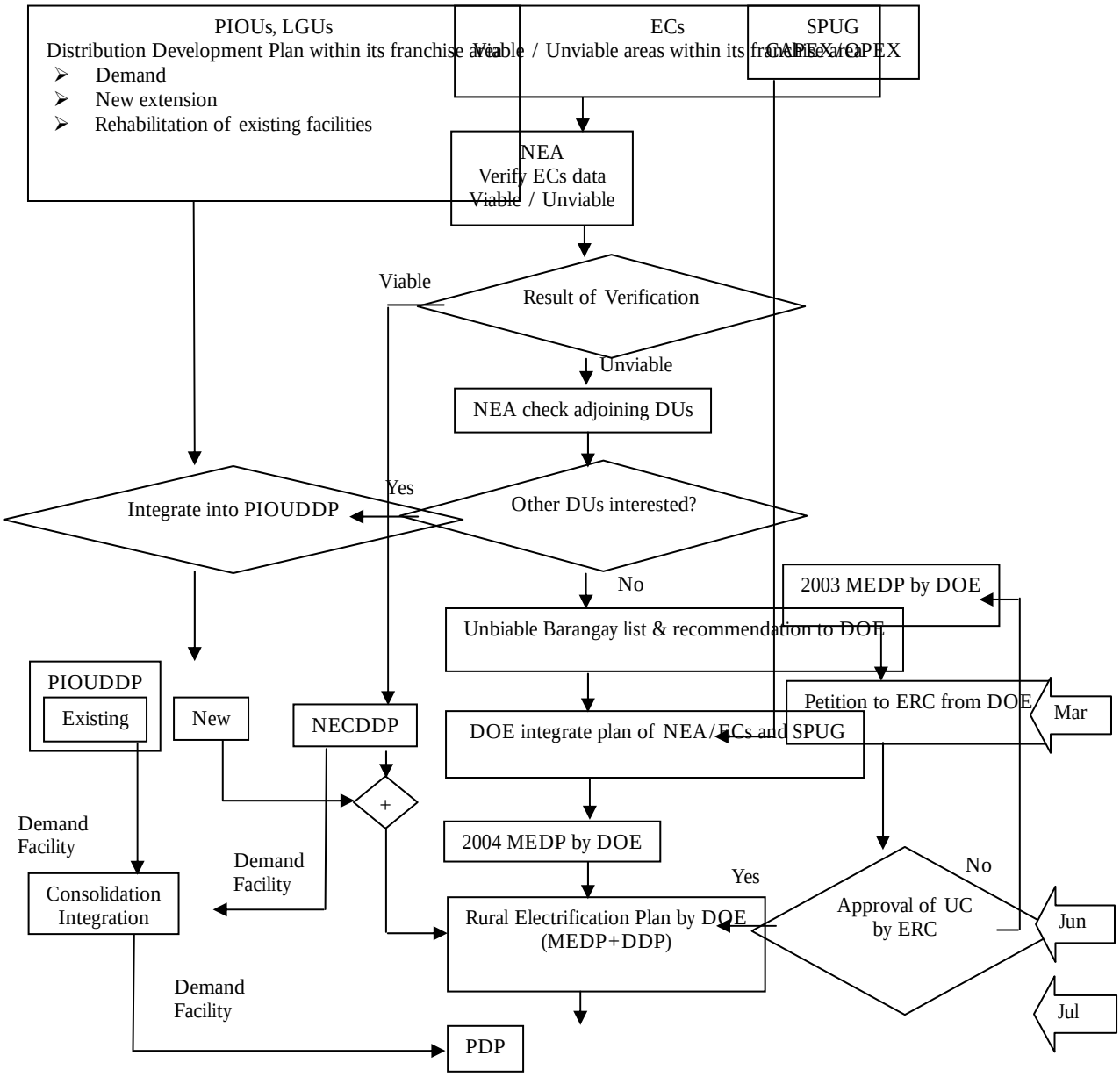



**Fig. 6.2 Workflow to prepare rural electrification plan**

### 6.2.3 Components and concept of MEDP

EPIRA, which was introduced in 2001, reinforces the acceleration of total electrification of the country with the promotion of indigenous and renewable energy resources via maximum participation of the private sector. Through IRR (Implementing Rules and Regulations),

DOE prepares a five-year MEDP together with NPC-SPUG and NEA. Moreover, the essence of MEDP is involved in PDP and is finally integrated into PEP. At its core, MEDP consists of the management of existing diesel power systems by SPUG, the installation of new power sources in rural areas, and the introduction of individual power systems in rural areas using DOE budget and finally the privatization of SPUG assets. For these items, DOE needs to prepare a rolling five-year plan.

### 6.2.4 Barangay electrification promotion plan

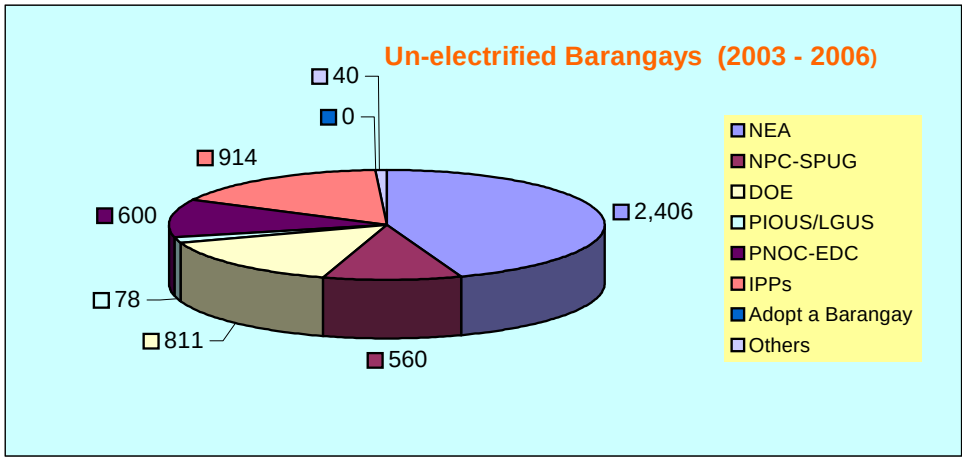
As mentioned in 6.1, as of December 2002, 5,409 barangays are still unenergized. The target of rural electrification is to achieve 100% barangay electrification by 2006; thus, a yearly plan to achieve the target is indicated in Table 6.2.

**Table 6.2 Barangay electrification plan 2003 - 2006**

| Year | Target Number | Remaining Number | Cumulative Number | Rate (%) |
|---|---|---|---|---|
| 2003 | 1,619 | 3,790 | 38,209 | 92.4 |
| 2004 | 1,258 | 2,532 | 39,467 | 94.4 |
| 2005 | 1,304 | 1,228 | 40,771 | 97.2 |
| 2006 | 1,228 | 0 | 41,999 | 100.0 |

Source: SONA as of Jun 2003

For the 5,409 unenergized barangays, the number of electrified barangays by the organizations concerned is shown in Fig. 6.3. According to this figure, grid extension by NEA takes the largest portion of the current electrification plan.




Source: O-I' Law Project Team terminal report

**Fig. 6.3 Number of electrified barangays by the organizations concerned**

### 6.2.5 Responsibilities and Concept of DDP

According to the detailed invocation regulations of IRR (Rule 7 Section 4) enacted in 2001, it is the responsibility of DU (Distribution Utility) to make a five-year establishment plan every year, and to submit it to DOE by March 15. ERC and DOE should prescribe the data to be submitted in advance. Especially important is unification by PDP and PEP. Furthermore, according to PDC (Philippine Distribution Code 6.2.5), if it depends, DU will ascertain the demand plans of important customers in the supply area, and will conduct an exact demand forecast. In addition, DU should make a distribution development plan based on demand every year, submit it to DMC (Distribution Management Committee) and DOE. DDP includes Energy and Demand forecasts, Distribution substation siting and sizing, Distribution feeder routing and sizing, Distribution reinforcement plans, etc.The data-gathering format explained later was created to efficiently collect this wide range of data. Furthermore, DU is responsible for as the following in DDP.

- Analyzing the impact of the connection of new facilities such as embedded generators, loads, distribution lines, etc.
- Planning the expansion of the distribution system to ensure its adequacy in meeting forecasted demand and connection of the embedded generator
- Identifying and correcting problems in power quality, system loss and reliability in the distribution system

Each organization must make an effort to play each of these roles. After considering their schedules, each organization should cooperate as much as possible with the organization concerned with making DDP.

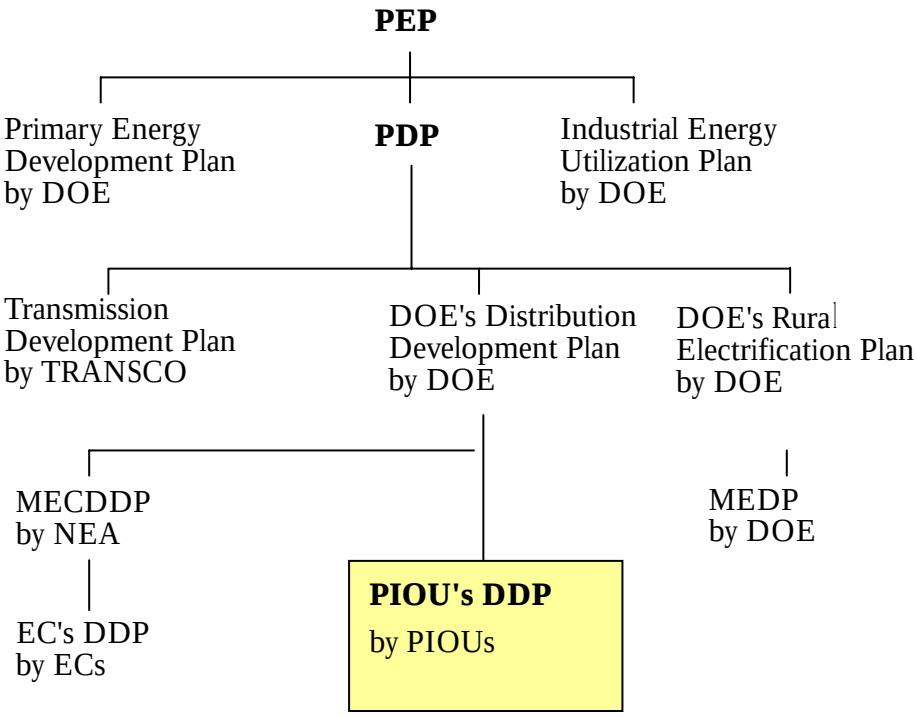



**Fig. 6.4 Configuration of each organization and each plan**

DDP is due to be constituted of the "Demand forecast," "Supply Plan," "Distribution Development Plan," "Critical point," and "Budget and Subsidy Plan," with the items required by the Philippine Distribution Code. DOE should make a five-year plan for these items. DOE is due to make a ten-year plan for demand and supply because a long-term view is required.

### 6.2.6 Outline of DDP

(1) Constitution of DDP

DDP is fundamentally created as a five-year plan from 2004 to 2008,

"Appropriate expansion construction based on demand"

"A capital plan corresponding to construction work"

Regarding this DDP, the above two points are important, as are self-help efforts of each DU to attain these as required. To check the balance of annual demand and supply for every area, using a comparison diagrammatic chart as shown in the following figure is recommended.

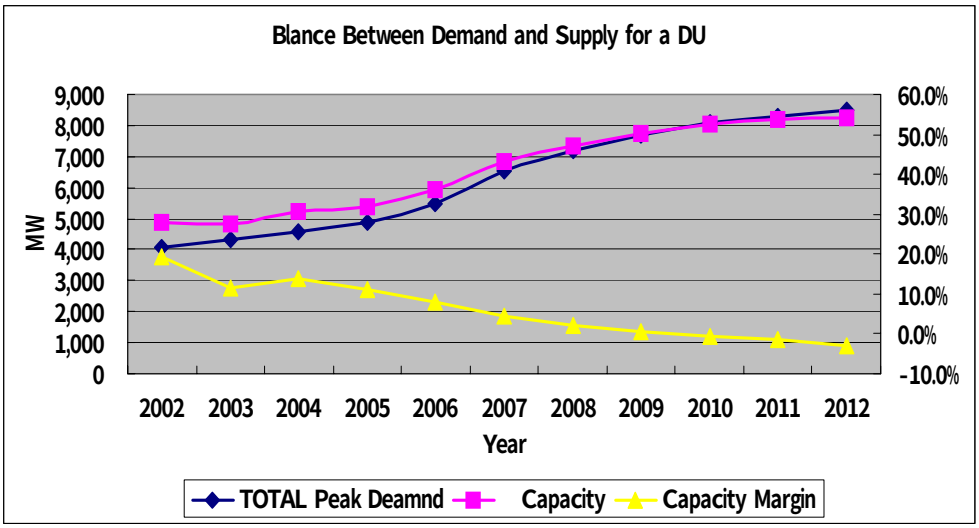



**Fig. 6.5 Example of balance comparison of demand and supply**

Furthermore, it is necessary to consider the issue of appropriate electric power supply of the future. To check the scale of distribution facilities (distribution lines length, installed capacity for distribution substation, etc.) by area: (LUZON, VISAYAS, MINDANAO), and to check the balance with demand and supply as a rough estimate, using a comparison table is recommended.

On the other hand, since distribution line expansion for electrification is contained in DDP, a link with MEDP is also required. It is necessary to consider covering both plans. Thus, DDP should be configurations in which it is as easy as possible to compare years and areas. Furthermore, we proposed the DDP that should be an easy-to-understand configuration after it contains the contents regulated by each code. The DDP drawing-up manual was created based on this, and it was submitted to DOE.

(2) Data gathering format

The schedule for making DDP is shown here. ECs submit the data to NEA by November or

December. The NEA collects the data of all of the ECs, and it is arranged as NECDDP by March 15. The PIOU data is directly submitted to DMC and DOE as PIOUDDP by March 15. DOE will collect all data and complete the National DDP. In addition, the National DDP is expected to be ready for next year. A database can be built by repeating this step every year.

In particular, for DUs that have not made this kind of development plan, the challenges in making DDP are significant. Therefore, to explain how to input the data and request submission of DDP, a workshop was held in Manila on July 7, 2003. There were about 100 participants comprising the representatives of all DUs and NEA, and the leader of each EC. The audience was eager and listened attentively and there were many questions from the participants. The document distributed at the workshop is appended.

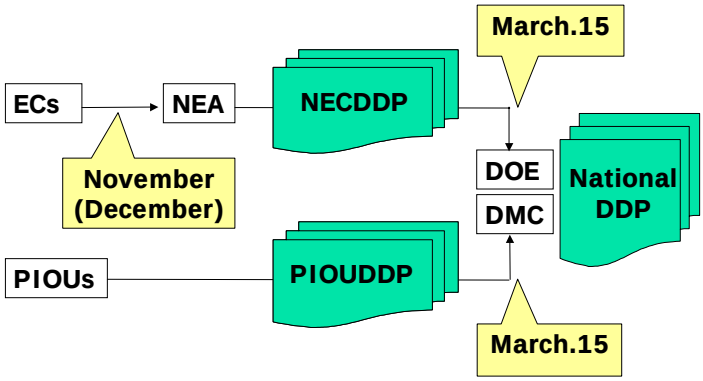



**Fig. 6.6 Schedule for making DDP**

A lot of time and effort were required to finalize a data format that met everyone's needs, in addition to asking for input from those concerned and collecting their answers. However, despite considering various opinions, the NEA format (which is very familiar to EC) may not change. Various opinions were raised, and it was extremely difficult to obtain the agreement of all those concerned. Many improvements were carried out to promote understanding by plainly explaining the changes that have been made Figures for comparison.

## 6.3 Organization of rural electrification promotion

The organizations concerned in rural electrification are shown in this figure. For rural electrification, DOE is the central organization that handles promotion. However, not only DOE but also NEA/ECs and PIOUs, and LGUs will participate in this field. In the private sector, QTPs (Qualified Third Parties) have clear criteria set by DOE to promote electrification in missionary areas. In future, QTPs will take charge of a significant portion of the funds for rural electrification promotion.

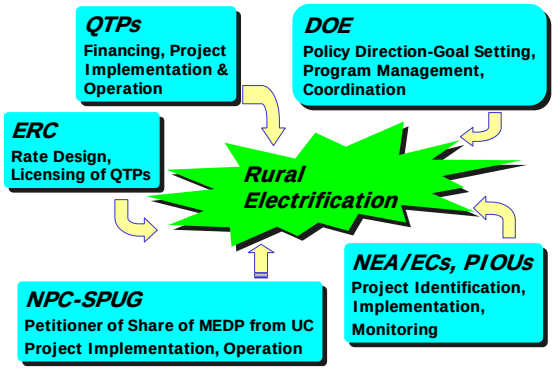



**Fig. 6.7 Organizations concerned for rural electrification**

In pursuance of the policy to ensure and accelerate the total electrification of the country, the DOE has targeted 100% barangay electrification by 2006. DOE and DOF jointly issued reiterating its commitment to total barangay electrification as well as to energize 90% of total potential households by 2017. Whereas, a review of the other electrification projects indicates the needs to refocus and strengthen its goal to integrate the expanded / over-all rural electrification thrust under MEDP. As a result, DOE created an Expanded Rural Electrification (ER) Team to manage effectively and integrate the country's rural electrification program. The ER team has two groups, one of which is the Oversight Committee and the other one is the Technical Working Group.

## 6.4 Database

The objective of rural electrification project is to electrify unenergized areas; thus, all unenergized areas in the Philippines are candidates. Therefore, selecting and prioritizing candidates are issues to be considered. Foremost is the need to avoid adding unenergized areas targeted for grid extension to the list for potential individual systems. In this respect, the planner must pay close attention to the grid extension plans and the actual energized situation of the area. On the other hand, the management of actual project promotion is also important.

(1) Current database situation

In the 2000 national census, the number of barangays was stated as 41,999. The O-I LAW team reported 41,995 and the Statistic Office notes 41,945. The data of each organization is different and is now under investigation. Moreover, the number and location of Sitios also remains unclear. Thus, it is possible that the barangays on the unenergized list have already been energized. To promote electrification, as of the end of 2000, 41 micro-hydro and 4,416

various types of PV system were introduced. However, the location and management condition after installation is also not fully understood. Therefore, to efficiently prepare an accurate plan, establishment of a database is required.

(2) Map for project management

The rural electrification project is required to prepare a future plan in parallel with actual project promotion. From this point of view, a map that manages project promotion including the electrification rate visually is a useful tool, as is the database for DOE. These maps contribute not only to the investigation of the future electrification plan after barangay electrification, but also practical project management.

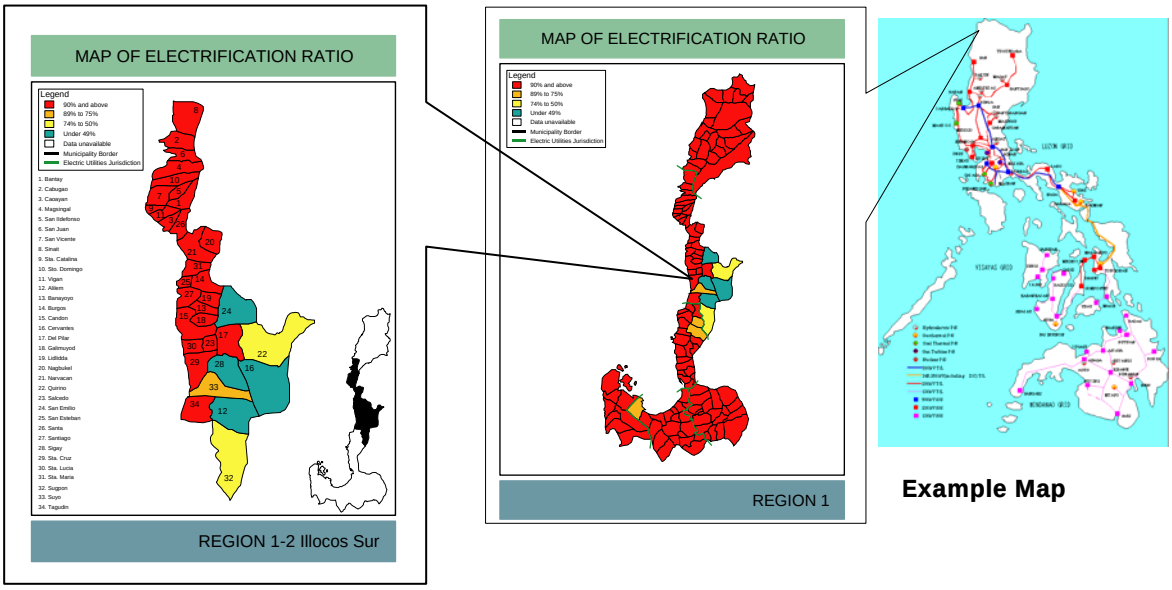



**Fig. 6.8 Map for the management of the electrification rate by ECs and municipalities**

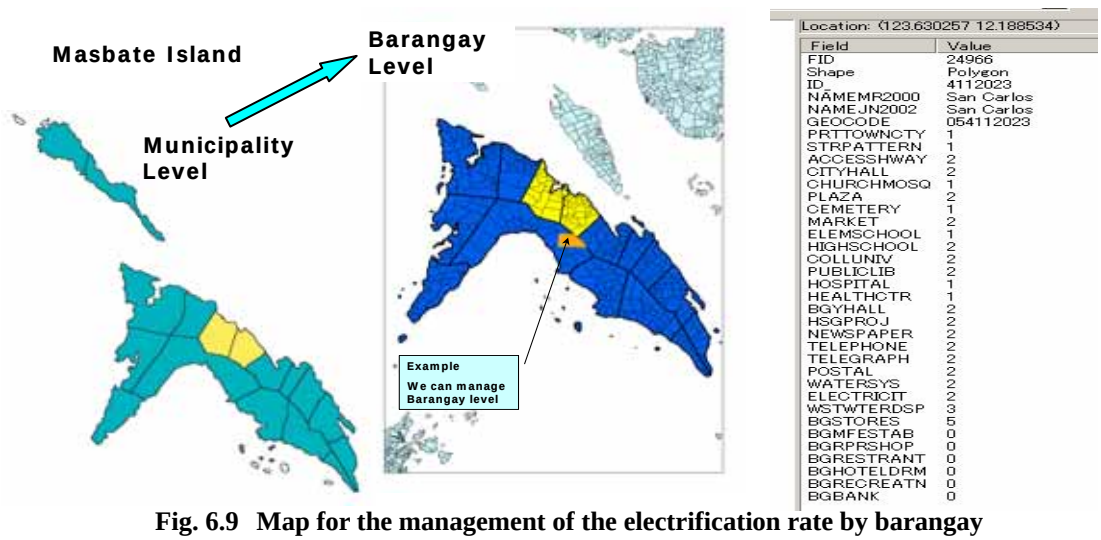



**Fig. 6.9 Map for the management of the electrification rate by barangay**

### (3) Potential of renewable energy

Rural areas of the Philippines such as islands and mountainous areas are difficult to access. Therefore, it is difficult to promote electrification through grid extension. In these locations, introducing individual power systems utilizing renewable energy is useful for electrification.

- Regarding insolation, the yearly average is 4.5～5.5 kWh/$m^2$ in the Philippines. It is 50% or higher than Japan's average, which is about 3.5 kWh/$m^2$. These data indicate that the availability of the PV system is a useful method of promoting the electrification of barangays that are located far from the grid line.

- The rainfall in the southern part of the Mindanao area and Palawan is lower than in other areas. However, the average of the other areas is relatively high, and these areas have the potential for introducing micro-hydro systems depending on their geographical condition.

- The northern part of Luzon and Palawan is expected to have high wind energy potential, and these areas are suitable locations for wind power generation. However, the Mindanao area has few available locations for wind energy.

## 6.5 Operation situation and subject of SPUG

### 6.5.1 Current situation of the operation of existing facilities and management

According to a petition paper for the universal charge from NPC-SPUG to ERC dated Jan/02/2003, the results of 2002 and the forecast for SPUG operations after 2003 are shown in Table 6.3.

**Table 6.3 Actual results and forecast of SPUG operations**

| Items \ Year | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|
| Phil. Energy Sales, GWh | 47,917.00 | 52,093.00 | 56,978.00 | 62,459.00 | 68,625.00 |
| SPUG Energy Sales, GWh | 548.63 | 669.66 | 820.94 | 986.95 | 1,135.53 |
| Projected Revenue (Million PHP) | 2,225.28 | 3,146.09 | 4,199.46 | 5,462.61 | 6,808.03 |
| Total Cash Expenses | 6,208.09 | 8,169.05 | 9,031.74 | 11,983.58 | 16,173.16 |
| Operating Cost | 3,451.32 | 4,817.57 | 6,184.81 | 7,942.27 | 9,914.65 |
| Fuel | 2,106.23 | 3,095.81 | 4,188.61 | 5,523.11 | 6,990.84 |
| Lube | 105.01 | 136.56 | 175.41 | 218.79 | 259.59 |
| Purchased Power | 484.72 | 647.02 | 856.96 | 1,177.21 | 1,592.06 |
| Personnel Services | 473.19 | 497.20 | 498.31 | 523.81 | 550.70 |
| Other O&M | 282.16 | 440.98 | 499.35 | 499.35 | 521.39 |
| Capital Expenditure | 2,756.78 | 3,351.49 | 2,846.93 | 4,041.31 | 6,258.51 |
| Generation | | | | | |
| Grid Project | 1,783.76 | 1,809.85 | 1,328.42 | 2,487.51 | 4,745.76 |
| Off-grid Project | 296.51 | 321.31 | 348.42 | 376.11 | 408.02 |
| Transmission | 327.21 | 598.23 | 532.33 | 485.36 | 384.44 |
| Operations | 349.30 | 622.10 | 637.76 | 692.33 | 720.29 |
| Cash Subsidy (Million PHP) | 3,982.81 | 5,022.96 | 4,832.28 | 6,520.97 | 9,365.13 |
| Total Levy (PHP/kWh) | 0.0831 | 0.0964 | 0.0848 | 0.1044 | 0.1365 |
| Operating Cost (OPEX) | 0.0256 | 0.0321 | 0.0348 | 0.0397 | 0.0453 |
| Capital Expenditure (CAPEX) | 0.0575 | 0.0643 | 0.0500 | 0.0647 | 0.0912 |

Source: In the Matter of the Petition for the Availments from the Universal Charge the Share for Missionary Electrification

Based on this table, the amount of power sales and revenue is increasing. However, the amount of subsidy required is more than that of the revenue. The operation and management fee of 2006 is almost triple that of 2002. Of the operational expenses of SPUG facilities, fuel cost in particular, occupies a big portion because the fuel cost of 2006 is assumed to be almost triple that of 2002. This has some relation to rural electrification by SPUG, which promotes the introduction of diesel generation systems.

### 6.5.2 Universal Charge

A total of 0.0831PHP/kWh for 2002 of universal charge was required from ERC by SPUG. This amount of UC consists of 0.0575PHP/kWh, including new electrification costs for 140 barangays. However, ERC approved the 0.0373PHP/kWh of UC, and the details are shown in Table 6.4. It considered expenses that would be incurred by SPUG sufficient to accomplish 44 of the 88 prioritized projects within the remaining month of 2003. A total of 44 projects, which are the existing areas of SPUG, did not consider any of 140 barangays identified for new electrification. For ERC, identification of areas for electrification in unenergized areas is necessary for transparency in charging UC. Consumer groups demand the full disclosure of expenses charged against the missionary electrification share. ERC advised SPUG to seek other fund sources in addition to UC to promote missionary electrification.

**Table 6.4 Approved UC**

| Year / Items | 2002 Required | 2002 Approved | 2003 Required |
|---|---|---|---|
| Phil. Energy Sales, GWh | 47,917.00 | 47,197.00 | 52,093.00 |
| Total SPUG Revenue (Million PHP) | 2,225.28 | 2,223.04 | 3,146.09 |
| Total Cash Expenses (Million PHP) | 6,208.09 | 3,566.35 | 8,169.05 |
| Operating Cost | 3,451.32 | 2,966.59 | 4,817.57 |
| Fuel | 2,106.23 | 2,106.23 | 3,095.81 |
| Lube | 105.01 | 105.01 | 136.56 |
| Purchased Power | 484.72 | - | 647.02 |
| Personnel Services | 473.19 | 473.19 | 497.20 |
| Other O&M | 282.16 | 282.16 | 440.98 |
| Capital Expenditure (Million PHP) | 2,756.78 | 599.76 | 3,351.49 |
| Generation | | | |
| Grid Project | 1,783.76 | 599.76 | 1,809.85 |
| Off-grid Project | 296.51 | - | 321.31 |
| Transmission | 327.21 | - | 598.23 |
| Operations | 349.30 | - | 622.10 |
| Estimated UC-ME (Million PHP) | 3,982.81 | 1,343.31 | 5,022.96 |
| UC-ME for OPEX | | 743.55 | |
| UC-ME for CAPEX | | 599.76 | |
| **Estimated UC-ME (PHP/kWh)** | **0.0831** | **0.0373** | **0.0964** |
| Operating Cost (OPEX) | 0.0256 | 0.0143 | 0.0321 |
| Capital Expenditure (CAPEX) | 0.0575 | 0.0230 | 0.0643 |

### 6.5.3 Situation of SPUG operation

Based on the 2002 MEDP, which was prepared by DOE, the transition of a quantity of power sales, revenue, etc., of SPUG from 1990 to 2000 is shown in Table 6.5.

**Table 6.5 Transition of power sales and revenue of SPUG**

| Year | Energy Sales (GWh) | Net Revenue (Million PHP) | Subsidy (Million PHP) | | |
|---|---|---|---|---|---|
| | | | Operating | Capitalized | Total |
| 1990 | 83.70 | 113.50 | 59.29 | 122.78 | 182.07 |
| 1991 | 94.10 | 151.50 | 146.80 | 1,276.88 | 1,423.68 |
| 1992 | 119.40 | 213.40 | 193.46 | 1,518.10 | 1,711.56 |
| 1993 | 144.60 | 266.60 | 197.52 | 511.49 | 709.01 |
| 1994 | 165.30 | 325.10 | 292.57 | 785.83 | 1,078.40 |
| 1995 | 196.80 | 378.00 | 481.32 | 552.71 | 1,034.03 |
| 1996 | 224.10 | 432.00 | 616.50 | 147.51 | 764.01 |
| 1997 | 265.60 | 512.30 | 814.58 | 494.36 | 1,308.94 |
| 1998 | 310.60 | 605.00 | 1,183.53 | 250.35 | 1,433.88 |
| 1999 | 318.50 | 658.80 | 1,065.32 | 273.53 | 1,338.89 |
| 2000 | 347.40 | 773.90 | 1,905.90 | 287.34 | 2,193.24 |

Source: 2002 Missionary Electrification Development Plan

Based on this table, power sales and revenue increased year by year; however, subsidy is much higher than the sales revenue each year. Moreover, subsidy for investment (capital expenditure) in new electrification has decreased, and subsidy for operational expenditure increased from 1996. As a result, total subsidy has increased. This trend is due to the increment of diesel fuel consumption and the cost of maintenance because the SPUG facility for barangay electrification is diesel, and its operation hours are increasing. The five-year (2002 to 2006) budget plan is indicated in Table 6.6; however, subsidy, which is more than revenue, is continuously required for the next five years. Therefore, to reduce OPEX as much as possible, the current situation of SPUG facilities needs first to be analyzed.

## 6.6 Items to be considered in rural electrification

The promotion of the long-term electrification plan through grid extension and renewable energy is to be considered from the following point of view.

(1) Spread effect of electrification for rural development

In the Philippines, the population has been migrating to urban areas from rural areas. This has produced an economic gap between the cities and rural areas suffering from poverty. Thus, the government is paying great attention to improving standards of living and narrowing economic differences. They expect rural electrification to be one of the most effective solutions for these problems. Now the authorities are trying to facilitate large-scale rural electrification. Rural electrification will contribute to the creation of business opportunities and will reduce population shift. Furthermore, electrification has such synergy effect, such as improvement in information accessibility, increase in educational

opportunities and other kinds of benefit that will raise the standard of living of local people in the Philippines. In short, electrification planning is to be considered with the economic development of targeted areas.

(2) Introduce private investment into rural electrification

UC have decided to provide financial support for rural electrification. However, in the current situation, these public subsidies do not necessarily achieve the development of new energy because SPUG is running short of budget to maintain existing diesel generators due to the increase in fuel costs. On the other hand, ECs have also been suffering from budget shortage for further grid extension because subsidy from NEA is not sufficient. While there are some private funds from IPP companies like MIRANT, such financial support is not enough to implement the planning on schedule. Thus, to achieve the goal of rural electrification set by DOE, private investment is more than ever required.

(3) Dispatch long-term experts to prepare practical plans

# Chapter 7 Investment Promotion

## 7.1 Investment Promotion for power sector

In this chapter, the status of legislations (such as investment incentives and investment procedure) concerning the promotion of investment to the power sector is elaborated, referring to the examples of other Asian countries. Hereunder, the analysis will be made with regard to the following three issues, including the comparison with the other countries, and the recommendations for the resolution of issues will be proposed at the end: 1.Structure of Philippine power sector; 2.Current status of investment procedure to the electric power business; 3.Current status of the incentive plans for investment to the power sector.

## 7.2 Current Status of Investment Promotion Policy on Philippine power Sector

### 7.2.1 Structure of Philippine Power Sector

The Government established EPIRA (Electric Power Industry Reform Act) on June 8, 2001 (enforced on June 26).
Currently, various measures to implement the Act are being taken to vitalize the power sector. Unfortunately, however, the actual process towards the privatization tends to be largely behind the initial schedule, such as the sales tender of TRANSCO was not consummated, and the further progress of the power sector remain unforeseeable.

The major factors for this stagnation are:

a. Perceived political and regulatory risks
b. Business risks for IPP business (such as off-taker risk) have increased since the privatization of power sector.

### 7.2.2 Current Status of Investment procedure on Power sector

a. Approval period: The time-line of the acquisition of business license is unpredictable and long.
b. Unclear approval process: The number and procedure of necessary approval processes is not systemized.
c. Discrepancy between the law provisions and the actual implementation of approval process

d. Only limited support for investors under EPIRA

(1) Types of investment procedure to power sector

a. Investment procedure related to the public sector, such as BOT (Build Operate Transfer) and BOO (Build Operate Own) type contracts.
b. Investment by private sector (merchant plant for power pool market / relative contract with a distribution company)
c. Assets sales by NPC, such as Sucat and Limay Generation Plants

(2) Investment procedure / BOT,BOO businesses

The most important approval process for BOT business is that by NEDA (National Economic Development Agency). NEDA is an organization that handles the approval of significant business that the government sector is involved, but such problems are pointed out that the approval period is not always the same and it often takes quite a long time until the approval.

(3) Current status of investment procedure to private sector

In accordance with the privatization of NPC, it is predicted that the main line of investment type to the power sector hereafter will be new capital investment by private business (for example a merchant plant for an exclusive contract with a distribution company or for electricity pool market).

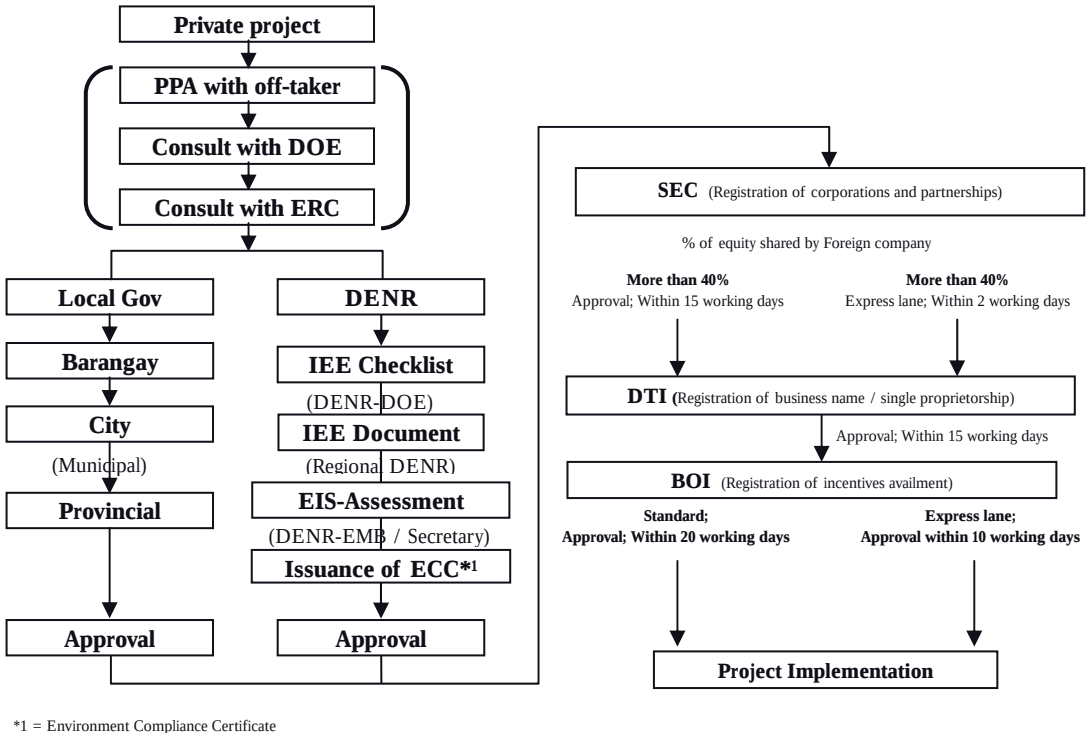



**Fig. 7.2.1 Investment Procedure / Private project**

Source: JICA Study Team

(4) Investment procedure / Assets sales of NPC(GENCO)

The basic structure of the process can be classified into 2 processes, i.e. the first process to obtain the government approval and the second process to consummate the sale/purchase and to conduct the business. In other words, it is presumed that this process will be somehow a mixture of above two processes (the cases of BOT/BOO business and the private projects).

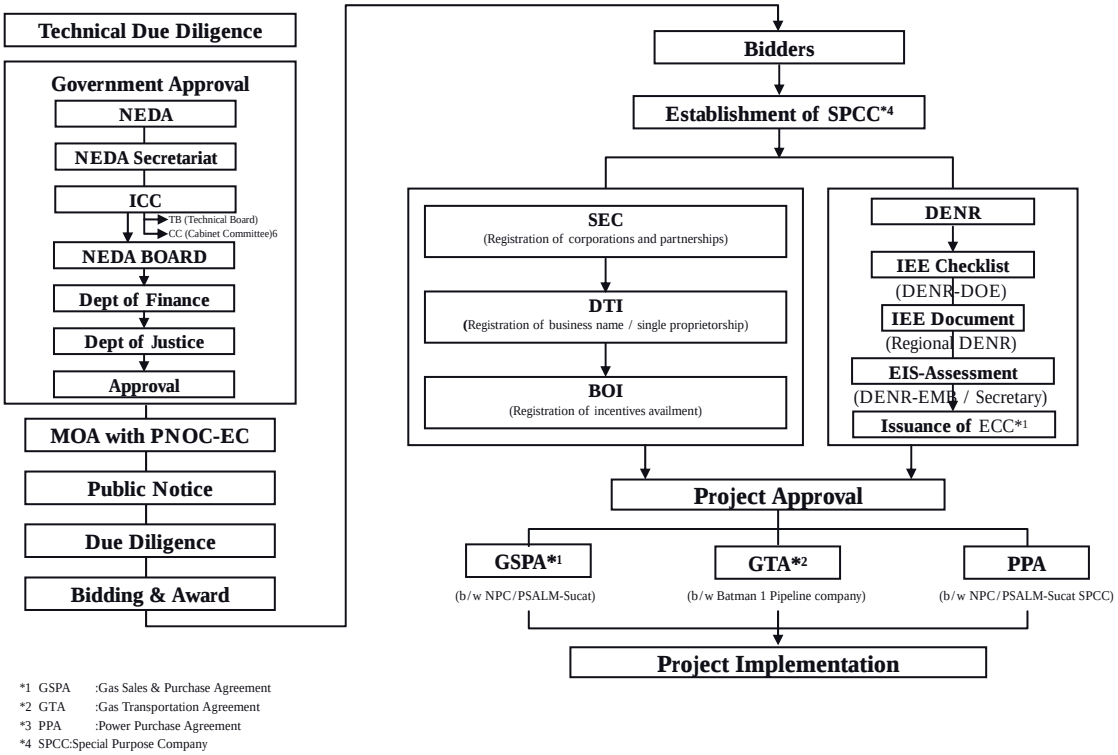



**Fig. 7.2.2 Investment Procedure / NPC(GENCO) asset sales (assumption)**

Source JICA Study Team

(5) Current status of environmental assessment

ECC (Environmental Compliance Certificate)
DENR is conducting the environmental assessment of energy related projects, promotion and support of renewable energy/natural gas business, etc., in cooperation with DOE.

(6) Current status of the approval process by local government

The problems of business application process required on the local government level as listed below are often pointed out as the hazard for the investment procedure required for Philippine power sector:

a. So many licenses/permits by the local governments are required.
b. It is necessary for the investors themselves to apply and obtain these licenses/permits, which is increasing the business risks (such as the delay of business start-up schedule) at the stage of application for investment.
c. There are quite a few guidelines for the investors regarding the approval process (especially local government process) and the investor support is insufficient.

### 7.2.3 Current Status and Problems of Incentives for Investment to Power sector

(1) Current status and problems of tax incentives for power sector

1) Income Tax Holiday (ITH)

The problems regarding ITH rule for the power sector are as follows:

a. The exemption is maximum 6 year and short (8 years in Thailand and Vietnam).
b. No tax discount is available after the exemption period (50% discount for 2 to 4 years in Vietnam).
c. The actual exemption period becomes even shorter for such reason as the delay of business implementation.
d. There are very few options regarding the reduction of corporate tax, such as the tax return for the reinvestment of profit.
e. General provisions are not applicable to the power sector due to its specific characteristics.

2) Deduction/exemption of VAT (Value-Added Tax)

VAT exemption has been applied so far to the power generation business in relation with NPC. The form of exemption is such that VAT is once paid and then returned by the tax return application, which involves many problems like the necessity of complicated application procedure to realize the tax return and the long time consumed for the procedure.

3) Import custom exemption

The importation of capital goods (machinery, etc.) related to the power generation business is not the object of import customs exemption at present and 3 to 5% import duty is assessed. Therefore, the business operators are to pay 13 to 15% tax for the combination of import duty and VAT.

4) Dividend tax ratio (rate of tax on the dividend paid to non-resident foreign corporation)

The standard tax rate is 32% for foreign corporations in Philippines. However, 15% tax rate is applied to the investment by Japanese corporation. (When there is a tax convention between two countries and the convention stipulates the tax rate specifically, such reduced

tax rate is applicable.

Even though a reduced tax rate is applicable to Japanese corporations according to the tax convention, Philippine tax is still higher in comparison with other countries.

5) Incentives on natural gas business

At present, the import duty rate is set as 3% for the importation from ASEAN region. (The standard import duty rate is 5%.) However, during our interviews, many local corporations preferred the importation from Middle East countries, such as Kuwait, to the importation from ASEAN countries, such as Indonesia, in view of the competitive pricing of the former.

(2) Current status/problems of other incentive plans for power sector

1) Incentive and guarantee on IPP business

By the power sector reform (after the privatization of NPC), the government guarantee is presumed to be lifted. Under such circumstances, it is very important how the investment risks of investment in IPP business can be avoided.

(a) Problems on IPP business

The environment around the operation of IPP business contains increasing number of negative factors and various issues such as the degrading financial soundness of distribution companies (off-takers) due to the alteration of electricity pricing system and the negotiation for the revision (price cut) of existing PAA.

(b) Future prospects

In order to make a decision of investment to IPP business, it is important to know if the procurement of fuel and the sale of electricity are secured steadily for a middle-long period ranging from 5 to 10 years, in addition to the information on the asset value of the power generation facilities. However, presently such information is insufficient and it is impossible to collect enough information to make judgment for investigation.

In addition, the incomplete system to transfer the fluctuation risk of electricity price timely to end users as stated before and the degrading financial soundness of distribution companies as the consequence will obviously work negatively to the judgment of investment. Furthermore, it was pointed as more fundamental problem

that serious risk existed in the short-sighted and ad hoc way of conducting the assets sales by Philippine Government, as represented by the twist and turn in course of the privatization of TRANSCO. Therefore, unless Philippine Government takes necessary improvement measures taking such mentality of investors into account, the chance to realize the introduction of purely private capital to IPP business will be remote.

## 7.3 Energy investment policy / how it should be

### 7.3.1 Proposal on Investment procedure

(1) Proposal to establish effective investment procedure

In order to solve this problem, a basic premise should be recognized that Philippine Government has to establish a policy to be proactively involved in the promotion of investment in order to reduce the burden of the investors.
As more desirable form, it is recommended that the approval processes including those related to the local government and environmental protection are bundled as a package and the adjustment among the related parties on the side of Philippines is completed before the opportunity is proposed to the potential investors in order to reduce their business risks.

(2) Effective way to provide the information on investment procedure, etc.,

It will be very much useful if there is a sort of check list for the approval process necessary to implement the business. Thus, in addition to substantial improvement of the investment procedure, it is considered to be important that the burden of investors is reduced as much as possible by means of enhancing the information service function.

### 7.3.2 Proposal on Tax system and Other Incentives

(1) Income Tax Holiday (ITH – Exemption of corporate income tax)

1) Extension of tax exemption/reduction period
   It is foreseen that, during the process of privatizing the power sector, the risks for the investors to embark on the electric power generation business will become larger than that under the present situation. Under such circumstances, it is quite important to take such measures as to reduce the risks by reinforcing the priority treatment in the taxation

system.
As to the period to apply ITH, an extension to 10 years will be appropriate.
It is also necessary to flexibly handle the awarding of priority incentives.

Also, the introduction of incentives on the reinvestment of the profit from investment, such as the exemption of corporate income taxes should be considered.

(2) VAT (Value Added Tax)

As for VAT, it will be necessary to provide an explicit exemption rule instead of existing tax refund system.

(3) Import custom exemption

Presently, 3% to 5% import duty is assessed on the importation of capital goods (machinery and equipment for the construction of plant) related to the fuel and power generation business and, when VAT is added, the tax burden is so high as 13% to 15%. (VAT 10% + Import Duty 3 - 5%) The establishment of import duty exemption rule is considered as an issue to be examined.

(4) Dividends Tax

The tax rate assessed on the dividend in Philippines is still high even after the application of special rate by Philippines-Japan Tax Convention. So, it is recommendable to take up an issue of tax rate reduction. In this relation, although the reduction of dividend tax is an effective measure, an idea to establish such priority treatment as tax exemption for the internal reserves of business corporations is also considered to be effective for the same purpose.

(5) Import custom on natural gas import

At present, instead of standard 5% import duty, a preferential tax rate of 3% is applied to the import from ASEAN region. We suggest to eliminate the discrimination between ASEAN countries / Non-ASEAN countries with regard to the tax rate of Natural Gas import.

(6) Incentives on IPP business

1) Strong commitment of the government

As to the operation of IPP business under the condition that the government guarantee is no longer available, the investor risks are considered to be too big and it is doubtful if the introduction of foreign capital will be realized as planned. The primary reason is thought to be insufficient commitment to the projects on sale by the Government.

In case of the sale of power generation plants like Sucat and Limay, there are uncertain factors such as whether the installation of Bat-Man 1 and Bat-Man 2 pipelines will progress as scheduled and how the gas procurement costs will fluctuate. It is necessary to consider the reduction of investment risks by clearing off these uncertainties for the sale of assets in future.

2) Flexibility in NPC assets sales
It will be necessary, under the present situation that the disposal of assets is not proceeding as planned, to adopt more realistic plans that will improve the investors' mentality toward the purchase of assets in future, by means of accumulating the successful cases of selling assets which are more suited for investment.
For example, the sale of other assets and projects which has less investment risks (for example; coal thermal power generation plants, conversion of the use of imported coal to domestic coal at these coal thermal generation plants, and other oil combustion and diesel power generation plants) can be one effective way.

3) Support mechanism to investors
It will reduce the risk of investors, if DOE will cooperate by way of supplying the demand forecast data in the surrounding area to enable the clarification of electricity sales income prospects.

## 7.4 Energy Investment Promotion Office

### 7.4.1 Current Status of Energy Investment Promotion Office

Initially, EIPO was planned to have three departments, namely; a) Petroleum and Natural Gas Dept., b) Renewable Energy Dept., and c) Conventional Type Power Generation Dept., and to designate each 2 specialized officers to the departments. However, due to such problems as shortage of available staffs, partial modification was made to the plan. Presently, it is planned to assign 5 members in total, consisting of an Assistant Secretary as the top officer, a Chief Officer, two Senior Supervisors and a Support Staff. (Please refer to the chart below.)

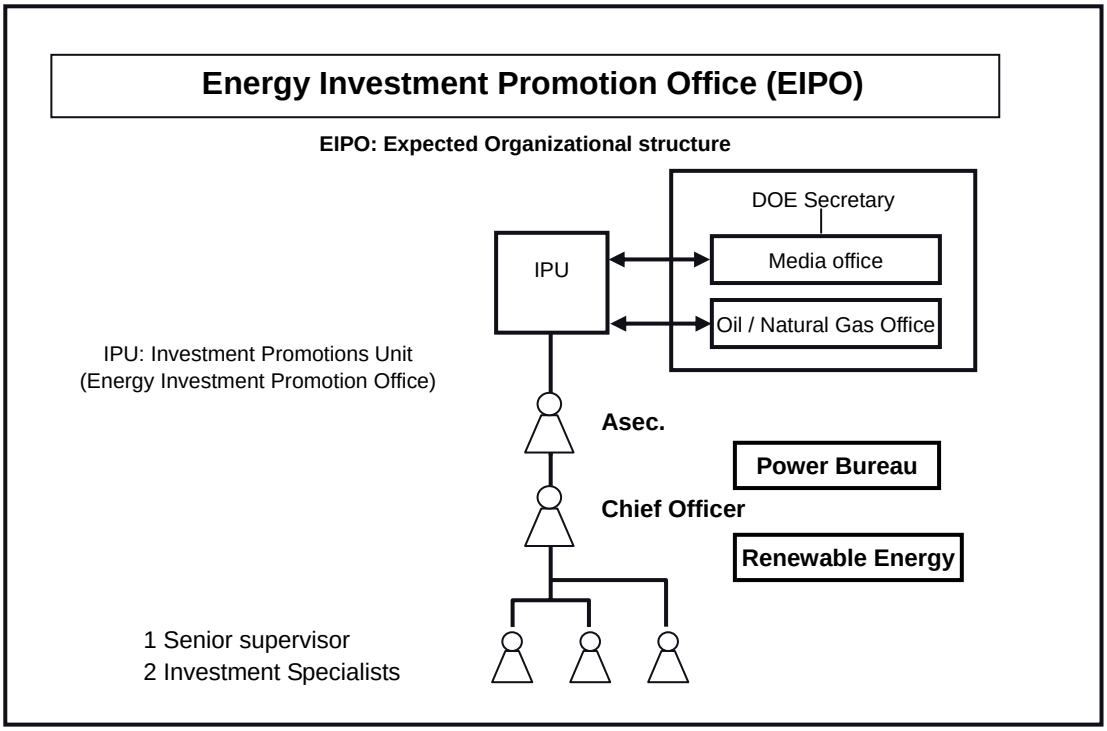



**Fig. 7.4.1 EIPO: Expected Organizational structure**

Source: JICA Study Team (based on the hearing from EIPO

### 7.4.2. Current Status of Information Supply for Investment to Power sector

DOE is offering various information on its website. And, it is possible to read out such information as the status report of on-going projects, like those listed below. However, the information service is not effectively functioning yet because of insufficient tools to manage the information and to post it publicly and also because of incomplete operation body both organization-wise and staff-wise.

### 7.4.3 EIPO / how it should be

The expected function of EIPO is to work as a general information desk in the field of investment promotion to the energy sector. In particular, the following functions have to be provided:

a. To supply information on each individual energy project
b. To find out potential investors and promote investment opportunities to such potential investors
c. To supply information continually to investors and follow up the consequence, and to

conduct the adjustment and coordination with various investment related agencies such as BOI

d. To prepare an environment (website system) to enable the information exchange with investors

(1) EIPO as “One-stop shop”

It is desirable that EIPO has a function to serve as an organization which can supply all necessary information to investors as a package (one-stop shop function).
It is also natural for investors to start the initial contact from DOE, which is the ministry in charge, and proceed on the judgment of investment. Therefore, it is desirable if DOE/EIPO intensify the cooperation with BOI and increase the convenience for the investors.

(2) Close cooperation with BOI and other related agencies

(a) Current situation of cooperation among ministries and agencies
According to the interviews, the coordination is mainly conducted on the basis of personal relations utilizing the human network which each staff of BOI in charge built with the counterparts of other ministries and agencies. Therefore, the network has to be rebuilt whenever there is a relocation of staffs. It is deemed necessary to establish more permanent cooperative relation as a system.

(b) Cooperation between EIPO and BOI
When a investor wants to obtain and discuss detailed information on the investment incentives, the investor can proceed on the negotiation smoothly if EIPO and BOI are in cooperation.

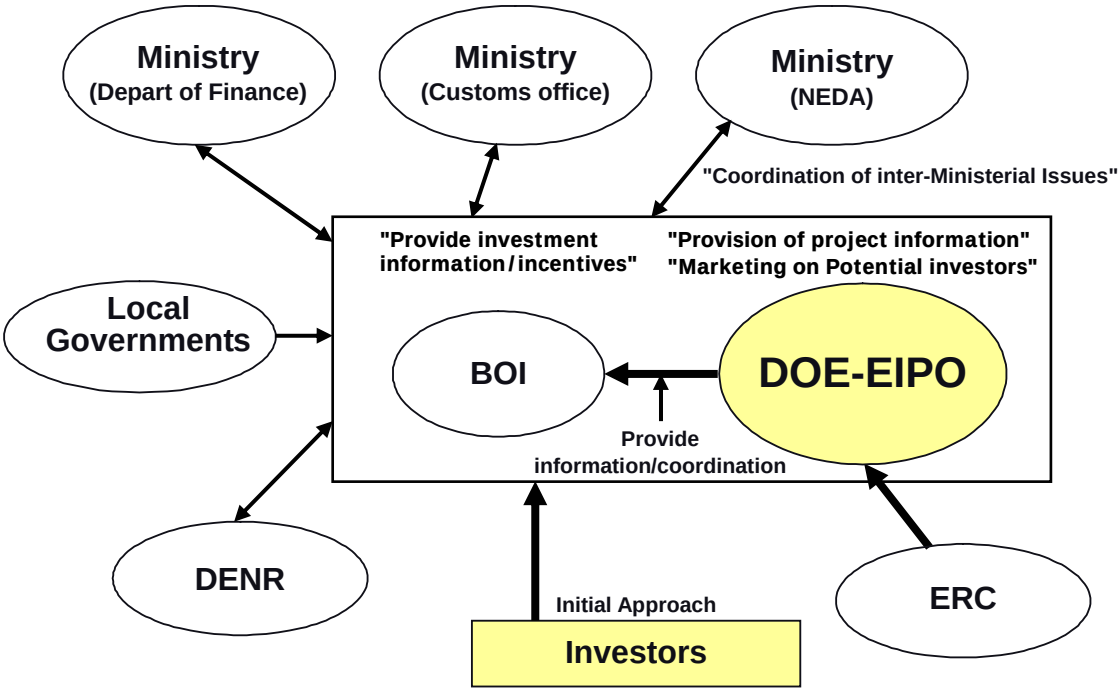



**Fig. 7.4.2 Coordination plan among power-related agencies**

Source：Based on the hearing from EIPO / Philippine BOI (Board of Investment)

(3) Communication tool with investors via Web

EIPO has to supply information as effective as possible toward the investors in the world. In order to carry out effective communications with many unidentified investors, it is important to prepare a tool that enables two-way communications with investors without the barriers of time and distance, or more specifically a well established Web environment that enables the supply and exchange of various information.

## 7.5 Outline of Information Distribution System for EIPO

### 7.5.1 Objectives / Effectivity

(1) Objectives

Presently, DOE handles the information of energy related domestic projects to be taken up by the ministry in form of paper documents and, therefore, the users who can read out the information are limited, the time required to review the information is too long and the

deterioration and loss of the media is concerned, all of which are serious problems being involved in the utilization and the management of documents.

Therefore, the objectives of this "Department of Energy Investment Promotion System" are to enable effective management of data concerning the privately operated investors and the projects by means of cutting edge IT technology and to contribute to the promotion of investments to the future business in the energy field by realizing smooth communications with privately operated investors via the Web.

(2) Effectivity

1) Efficient office work in DOE
   - Improvement of data entry accuracy and speed,
   - Improvement of convenience and speed for reviewing the data,
   - Promotion of information sharing in the ministry, and
   - Prolongation of document storage period and reduction of possible deterioration and loss of the media

2) Smoother communications between DOE and investors
   By the introduction of WEB database,
   - Timely and accurate management of investors' intention,
   - Improvement of convenience for investors, and
   - Timely and accurate transmission of DOE's intension to investors

### 7.5.2 Major Functions

This system enables administrator / investors to search, read out, input, modify and delete the data stored in the database.

| Function for DOEadministrator | Function for investors |
|---|---|
| 1) To search profile data of projects and privately operated investors<br>2) To input, modify and delete profile data of privately operated investors<br>3) To input, modify and delete project profile data<br>4) To express interest in each independent energy project<br>5) Data management, searching, downloading and printing | 1.General User<br>search and read out profile data of the registered projects in the database<br>2.Login users<br>1) To search profile data of projects and privately operated investors<br>2) To input, modify and delete profile data<br>3) To input, modify and delete profile data of projects<br>4) To express interest in each individual energy project |

The following sample figures are:

- Image of first page after log-in as a example of user interface (screen)
- Flow of profile data and project data entry
- Data format of profile data and project data

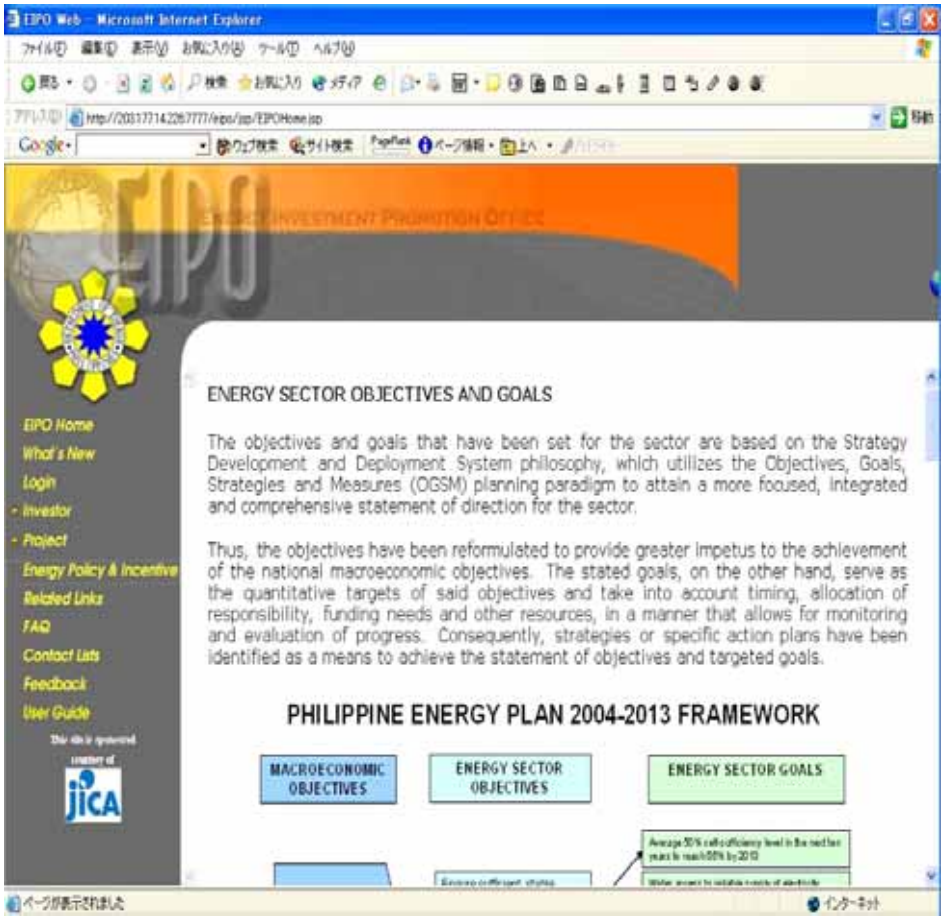



**Fig. 7.5.1 EIPO-Investors Log-in interface**

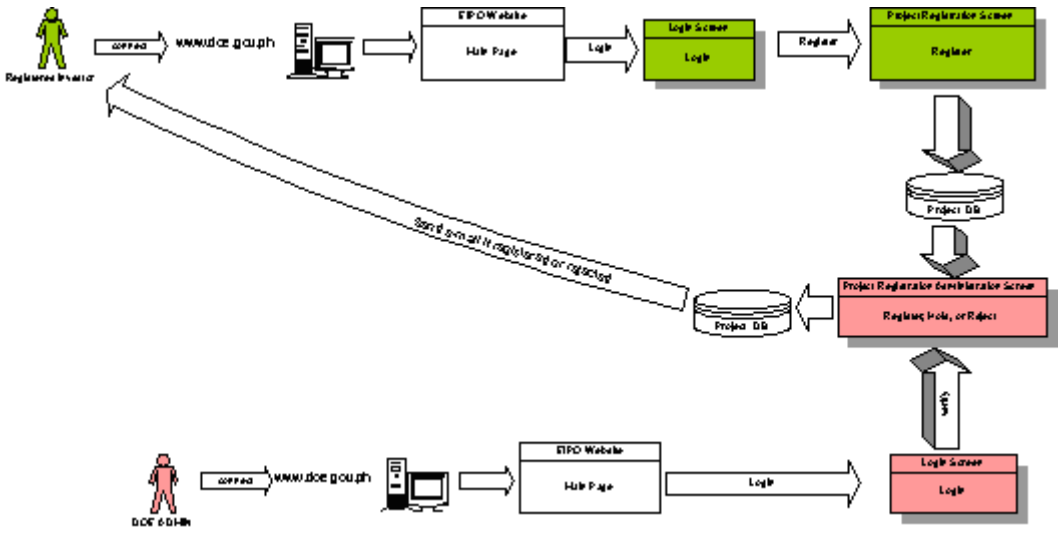


**Fig. 7.5.2 EIPO Registration flow: Project data**

### 7.5.3 System Configuration

- Hardware: Proliant ML370 T03 (HP)
- OS: Windows2003 Advanced Server
- Database: Oracle9i (License: Processor License)
- Application Server: Oracle9iAS (License: Processor License)