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The Follow-up Study for the Study on the Institutional Capacity Building for the DOE under a Restructured Philippine Electric Power Industry in the Republic of the Philippines

Final Report

December 2004

Japan International Cooperation Agency
Economic Development Department

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Preface

In response to a request from the Government of the Republic of Philippine, the Government of Japan decided to conduct the “The Follow-up Study for the Study on the Institutional Capacity Building for the DOE under a Restructured Philippine Electric Power Industry in the Republic of the Philippines" and entrusted the Study to the Japan International Cooperation Agency (JICA).

JICA sent a Study Team, headed by Mr. Hiromi Sakakibara of the Chubu Electric Power Co., Inc. and constituted of members of Chubu Electric Power Co., Inc. and Mitsubishi Research Institute, Inc. to Philippine five times from July 2004 to December 2004.

The Team held discussions with the officials concerned of the Government of Philippine and conducted related field surveys. After returning to Japan, the Team conducted further studies and compiled the final results in this report.

I do hope that this report will contribute to the development of Electric Power Sector and to the enhancement of amity between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Philippine for their close cooperation throughout the Study.

December 2004

Tadashi Izawa
Vise President
Japan International Cooperation Agency

December 2004

Mr. Tadashi Izawa
Vise President
Japan International Cooperation Agency
Tokyo, Japan

Dear Mr. Izawa,

Letter of Transmittal

We are pleased to submit to you the report of "The Follow-up Study for the Study on the Institutional Capacity Building for the DOE under a Restructured Philippine Electric Power Industry in the Republic of the Philippines". This study was implemented by Chubu Electric Power Co., Inc. and Mitsubishi Research Institute, Inc. from July to December 2004 based on the contract with your Agency.

This study is the follow up to the former study, "The Study on Institutional Capacity Building for the DOE under a Restructured Philippine Electric Power Industry in the Republic of the Philippines", which was conducted from September 2002 to March 2004. The follow-up study was aimed to implement further technical skill transfer for the independent PDP preparation by the Department of Energy (DOE).

The Study Team provided the capacity building for the DOE counterparts to prepare the PDP. There are indications already that DOE is in the process of enhancing its capability to prepare the PDP by themselves in the near coming years. We hope that sustainable capacity building within the DOE will be implemented to continue the skill transfer and improve on the capability.

Moreover, based on the DOE requests to support the PDP preparation, JICA has provided the DOE with the PDP data management system which was officially launched in November 2004. We hope that the system supports data gathering, data analysis for the DOE.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs and the Ministry of Economy, Trade and Industry. We also wish to express our gratitude to the organizations which have supported and assisted our activities throughout the Study, namely the Philippine DOE, Embassy of Japan in the Philippines, JICA Philippine Office, and other agencies concerned in the Philippines.

Truly yours,
Hiromi SAKAKIBARA

Team Leader
The Follow-up Study for the Study
on the Institutional Capacity Building for the DOE
under a Restructured Philippine Electric Power Industry
in the Republic of the Philippines

Abbreviations

ABB	Asea Brown Boveri
ADB	Asian Development Bank
AF	Adjustment Factor
AGMO	Autonomous Group Market Operator
ASEAN	Association of South East Asian Nations
BOI	Board of Investments
BOO	Build Own Operate
BOT	Build Operate Transfer
CAPEX	Capital Expenditure
CBRED	Capacity Building to remove Barriers to Renewable Energy
DDP	Distribution Development Plan
DENR	Department of Environment and Natural Resources
DOE	Department of Energy
DSM	Demand Side Management
DTI	Department of Trade & Industry
DU	Distribution Utility
EC	Electric Cooperative
EIPO	Energy Investment Promotion Office
EPIMB	Electric Power Industry Management Bureau
EPIRA	Electric Power Industry Restructuring Act
EPRI	Electric Power Research Institute
ERB	Energy Regulatory Board
ERC	Energy Regulatory Commission
EXECOM	Executive Committee
GDP	Gross Domestic Product
GENCO	Generation Company
GRDP	Gross Regional Domestic Product
EIF	Energy Investment Forum
JICA	Japan International Cooperation Agency
IMO	Independent Market Operator
IPP	Independent Power Producer
IRR	Implementing Rules and Regulations
LF	Load Factor
LOLP	Loss of Load Probability
MEDP	Missionary Electrification Development Program
MERALCO	Manila Electric Company
MMS	Market Management System
NEA	National Electrification Administration
NEDA	National Economic Development Authority
NPC	National Power Corporation

OSAC	One-Stop Action Center
PDP	Power Development Program
PEMC	Philippine Electricity Market Corporation
PEP	Philippine Energy Plan
PIOU	Private Investors Owned Utilities
PJM	Pennsylvania – New Jersey – Maryland
P/S	Power Station
PSALM	Power Sector Asset & Liability Management Corporation
PSE	Philippine Stock Exchange
PSS/E	Power System Simulator for Engineering
SEC	Securities and Exchange Commission
SPS	Special Protection Scheme
SPUG	Small Power Utilities Group
S/S	Sub Station
TRANSCO	National Transmission Company
TDP	Transmission Development Program
TOU	Time of Use
TSC	Transition Supply Contracts
UNDP	United Nations Development Program
WESM	Wholesales Electricity Spot Market

The Follow-up Study for the Study on the Institutional Capacity Building for the DOE under a Restructured Philippine Electric Power Industry in the Republic of the Philippines

Final Report

Table of Contents

List of Figures

List of Tables

1. Overview of the Study

1.1 Background

The Electric Power Industry Reform Act of 2001 (EPIRA) was enacted on June 8, 2001 and effective on June 26 of the same year in the Republic of the Philippines. The law aims to establish a framework for reforms in the electric power industry. The structural reforms affect distinct sectors, namely generation, transmission, distribution and supply sectors, under the oversight of the Department of Energy (DOE).

The role of the DOE is mandated pursuant to the 17 clauses in Section 37 of EPIRA. EPIRA identified new tasks for the DOE and the latter external needs support to perform their new obligations.

In response to DOE's request for assistance, the government of Japan appointed JICA as the government agency to support the DOE. JICA conducted the study entitled "The Study on the Institutional Capacity Building for the DOE under a Restructured Philippines Electric Power Industry in the Republic of the Philippines" from October 2002 through March 2004.

In this study, JICA accomplished the following four tasks to improve the institutional capacity and to enhance the human resources capability of the DOE:

1. Support for the formulation of the Power Development Plan (PDP) (including coordination with the subordinate plans);
2. Support for the formulation of the Missionary Electrification Development Plan (MEDP);
3. Support for the approval of the Transmission Development Plan (TDP) submitted to the DOE by the National Transmission Corporation (TRANSCO); and
4. Support for the development of the Energy Investment Promotion Office (EIPO) information system.

The planned consultation period of the study was two (2) years in view of the perceived difficulties associated with technology acquisition and assurance of technology transfer to the DOE. However, the period was shortened to one (1) year because the DOE had to present the PDP 2004 to the Congress by September 15, 2003.

In preparing the PDP, the DOE recognized the need for further support to fulfill its obligation on its own for the succeeding years and requested the follow-up study to JICA.

1.2 Objectives

The objectives of the follow-up study are as follows:

- Support for the strengthening of the DOE capacity for the formulation of the PDP.
- Establishment of data management systems for regular updating or monitoring of data/information.
- Support for the strengthening of the EIPO information system.

One of the main objectives of the study is to provide the DOE staff members with the capability to prepare the PDP by themselves through appropriate capacity building activities. Considering this, the JICA Study Team supported the DOE with the basic policy, *"The study team just supports the DOE in preparing the PDP, and it does not prepare the PDP directly."*

The Electric Power Industry Management Bureau (EPIMB) is a new DOE bureau created as a result of new mandate given to DOE by virtue of the EPIRA. The EPIMB lacks the required manpower resources to perform its functions. In order to realize the sustainable capacity building in the DOE, the JICA study team set the following target objectives:

- *Short-term objective:* To consolidate the institutional form and human resources to formulate the PDP for succeeding years; and
- *Medium and long-term objective*: To establish the institutional form to implement the capacity building for self-improvement in the DOE.

In this fiscal year, four persons have been assigned to the DOE. The DOE is highly motivated. The JICA study team contributes maximum support to the DOE with the greatest care so that DOE can formulate the PDP independently.

1.3 Main Activities, Assessment, Issues and Recommendations

1.3.1 PDP Formulation

Assistance on PDP Formulation

The EPIRA mandates that the DOE shall submit to the Congress the annual PDP Update every 15th of September of each year. In the 2004 PDP Update, some delays in the activities such as the regional consultations and meetings on the Distribution Development Plan (DDP) and the issuance of the official macro-economic targets were brought about by prioritization of activities in support of the national election on May 2004.

In the preparation, review and approval of the TDP, the critical factor for this year is the current financial crisis in the Philippines and this led to the setting of cap on the transmission projects expenditures. This requires the prioritization of projects within a specified ceiling. There are three scenarios being studied by a third party.

With these constraints, the DDP consultations and meetings with the distribution utilities (DUs) were conducted from last week of June through August 2004. The gross domestic product (GDP) targets for the Arroyo Administration was released by National Economic Development Authority (NEDA) in September 2004; so this is the only time when the peak demand estimation based on the econometrics approach was done.

The PDP was presented to the DOE EXECOM, Energy Family EXECOM and industry players in several meetings, for their comments and confirmation on the projected demand and projects to meet the simulated required capacity additions.

Assessment of DOE's Capability on the Preparation of the PDP

The main objective of this study is the institutional capacity building of the DOE for the preparation of the PDP. The present capability of DOE may be described as follows:

Demand Forecasting. For the preparation of the PDP (2005-2014), the DOE applied two methods for the demand forecast, i.e. (1) aggregation of the DDP demand prepared by DUs, and (2) previous macro econometric method. The former forecast was conducted by the DOE themselves this year. The latter forecast was also conducted by the DOE using the model developed by JICA from which the demand forecast was prepared accordingly. However, it is important for the DOE to study the related fields, such as statistics, in order to understand the results of the simulation model.

PowerDevelopment Plan. For the preparation of PDP (2005-2014), the initial run of WASP-IV was done by the JICA Study Team. After that, the DOE performed the WASP-IV run and updated the PDP by themselves. Also, the DOE is now capable of revising the input data and preparing the initial siting of power plant units by using the reserve margin as an index.

However, it must be noted that the most important point to remember when using the simulation software is not simply to get the resulting figures but to understand or evaluate the simulation results. In this regard, the DOE requires more experience and continuing guidance.

Optimal Siting of Units and Power Flow Analysis. The JICA Study Team has turned over to the DOE the GTMax to calculate and determine the optimal location/siting of plants and power flow. The GTMax was used for studying the feasibility of Leyte-Mindanao interconnection. However, only one staff of the DOE can handle it so far. To study the power flow using the GTMax, extensive time and manpower are required. Thus, with current human resources of the DOE , it seems difficult for the DOE to use the GTMax efficiently and effectively.

The capability of staff members of the DOE is at a fairly good level compared to other Southeast Asian countries. However, lack of experience in the use and analysis of simulation results should be supplemented through the self-training plan.

Table 1.1 DOE's Capability to Prepare the PDP

Activity	DOE Capability
Demand Forecasting	- DOE can prepare the demand forecast by aggregating the DDP. - DOE can prepare the demand forecast by using the macro-econometric model. However, they need to study more on refining the model in the area of statistics etc.
Power Development Plan (Supply Plan)	- DOE can handle the WASP-IV.
	- DOE can determine the generator's location by using the reserve margin as a guide
Power Development Plan (Optimal Location, Power Flow)	- DOE needs to handle the GTMax to solve these issues by using the provided model.
	- DOE does not have the capability to prepare the model by itself.
	- GTMax is necessary to determine the necessity of transmission projects, therefore, DOE needs to study harder to gain the ability to handle the GTMax.

Issues and Recommendations on the PDP Formulation

DOE Lack of Manpower. As indicated in the previous study, the Power Planning & Development Division (PPDD) of EPIMB remained undermanned. Therefore, the PDP preparation work is implemented only by a couple of staff members. For the short-term period, it seems to be efficient. However, the following issues and potential problems are expected to emerge in the long term-period:

1. A technical vacuum will be created when existing staff performing the work will in the future transfers, or retires or simply unable to work due to illness; and
2. There is no allowance to do further studies.

The first issue was touched in the previous study and the second issue is addressed in this study.. During the study implementation, it was observed that one staff member worked every weekend to prepare the necessary documents. From the viewpoint of work efficiency, it seems reasonable to concentrate most of the job to staff members who possess the greatest skill. However, from the viewpoint of sustainable capacity building, it is not efficient because of the following: (1) The staff will perform the job based only on their knowledge. 2) The staff member will not have extra time to expand their knowledge, by reading related documents and/or learning the simulation skills.

As will be described in Section 4, in order for the PDP to be prepared by the DOE in a credible and sustainable manner, self-training or instruction are necessary activities for the DOE. Therefore, being continuously undermanned is a potential cause of severe problems for the DOE for the medium to long-term. This issue should expected to be addressed as soon as possible.

Submission of the PDP to Congress. Pursuant to EPIRA, the PDP has to be submitted to the Congress by September 15th every year. However, the definition of \`submission\` is not clear. The DOE, due to some circumstances not within their control, has in the past submitted the PDP in its draft form. Requisites to the preparation of the PDP are the following:

- Issuance of the NEDA GDP forecasts on June every year;
- Submission of DDPs of DUs on or before 15 March every year;

To comply with the provision of the EPIRA, DOE has to review the preparation schedule of the PDP and must ensure effective arrangements among the concerned officies and organizations. Specifically, it is possible to facilitate the preparation schedule of power demand forecasting by using the tentative GDP rate submitted by NEDA. On the other hand, if the DOE will use the aggregated demand forecasts contained in the DDPs, the DOE can expedite the determination of the demand forecast by more than three months. It must be noted though that the DDPs submitted used the previous year`s NEDA GDP forecasts. Certainly, there are compromises in preparing the PDP more efficiently.

Energy Price for Long Term Prospection. As will described in Chapter 4, the DOE used the present energy price as long-term energy price. However, since the present energy price is always fluctuating, it would not be appropriate to use it directly as it stands.

In the process of the PDP (2005-2014) preparation, the increasing prices of coal and oil price need to be discussed. The rise in coal price is considered to be a result of the boom in Chinese economic activity. The rise in the oil price is considered to be a result of unstable oil supply associated with the Iraq War. The present price is expected to continue in the short term, however, for the long-term plan use, the price should be determined deliberately.

In principle, the DOE also has the responsibility to stabilize the energy price through their energy strategies. Of course, the electricity industry requires extensive energy. Therefore, the impact of the amount of energy used in the electricity industry on energy price should be considered. However, the PDP should be prepared in parallel with the energy policy of the country. In this sense the DOE has to determine the energy price trends before preparing the PDP.

Sustainable Capacity Building for DOE. As will described later in Chapter 9, the DOE has the basic capability to prepare the future PDPs. However, the institutional capability may be reduced by for example, retirement or transfer of staff in the future. To avoid a future reduction in capability and/or to increase their capability, the self-instruction of the DOE is considered to be very important.

To achieve this, the capacity building program has to be a systematic program consisting of (1) "On the job training (OJT)" through the actual preparation work, and (2) Self-instruction by using the materials provided, and has to have the specific target level set, i.e., "to be able to prepare the PDP including all related responsibilities within two years".

1.3.2 Transmission Development Plan (TDP) Preparation and Evaluation

Current Status of TDP Preparation and Evaluation

As of October 2004, the TDP2005 is still being prepared by TRANSCO because DOE has not officially released the demand projections and capacity expansion plan. Under the circumstances, the JICA Study Team, during the follow-up study mission, proceeded with the evaluation of the Leyte-Mindanao interconnection.

Given the country's current tight fiscal position, the administration has directed the various government agencies to prioritize investment projects. Consequently, TRANSCO developed and presented three (3) alternative Capital Expenditure (CAPEX) scenarios in its TDP for year 2004-2009. These scenarios present CAPEX Requirements at US$ 500 Million, US$ 850 Million and US$ 1,300 Million. The four major components of these three (3) CAPEX scenarios are:

1. Transmission lines rehabilitation/expansion/improvement/spares
   - (i) Operation & Maintenance
   - (ii) Head Office/System Operation/Metering Services
2. Projects
   - (i) On-going
   - (ii) New
3. Engineering and Administration
4. Interest During Construction

The difference among the three (3) scenarios is on the new projects component as to whether the project provided in 2004 TDP will be included or omitted. To provide an objective decision on this matter, PSALM hired EA Technology to conduct a CAPEX investment review. No final report has been submitted to date but there are indications on the EA Technology draft Review Report that the scenario to be recommended is that with a CAPEX requirement of US$850 Million.

Moreover, TRANSCO needs to come up with a prioritization of the projects following the guidelines issued by ERC on the optimization of its investment.

Technical Skill Transfer to DOE

During "The Study on the Institutional Capacity Building for the DOE under a Restructured

Philippine Electric Power Industry in the Republic of the Philippines" from 2002 to 2004, the JICA Study Team provided the PSS/E (Power System Simulator for Engineering) basic set for power flow calculation and short circuit calculation. In addition, the Team held technical seminars and transferred technical knowledge and skill, such as the basics of system analysis and program operation, to the DOE.

However, PSS/E has a lot of functionalities and it will take some time for the DOE to master its operation. The JICA Study Team, during the follow-up study, provided the DOE with hands-on training. However, there was limited time and concerned staff of DOE are loaded with so many other work related to transmission sector, particularly the review of CAPEX and the individual projects of 2004 TDP.

Meanwhile, transmission stability problems are expected to occur in the Luzon system in the future. The JICA provided the DOE with the dynamic simulation set and hands-on training for stability analysis during the follow-up study.

During the training, the Team adopted the Philippine Grid for the simulation and instructed the DOE not only on system analysis but also on the likely problems to occur in the Philippine Grid.

Chapter 5 will present a detailed discussion of the case studies handled.

Issues and Recommendations

Manpower Requirement for TDP Evaluation. The PPDD of the EPIMB is responsible for evaluating and approving the TDP, and its integration into the PDP in the DOE. Currently, only one staff member is assigned to the TDP section, though four staff positions were planned for TDP evaluation.The section handling the TDP is also in charged with the DDP.

A new process in formulating the PDP is being introduced, i.e. a bottom-up approach using the DDP of individual utility. It must be recognized that adequate time and effort are needed in reviewing and analyzing the DDP to understand its implications to the TDP and eventually to the PDP. Given the existing manpower complement of PPDD and its current workload, JICA mentoring the staff on the functionality of PSS/E was not done and consequently , leaves little opportunity for technical knowledge and skill transfer. It is critical, therefore, that hiring and/or appointment of needed staff be pursued.

TDP Preparation Schedule. The TDP preparation and evaluation in 2003 and 2004 were very much delayed. The DOE and TRANSCO prepared the PDP and the TDP respectively for the first time in 2003 and understandably, they needed extra time to study and perform the related data processing and analyses.

In 2004, it seems that external factors, such as current tight fiscal situation of the country makes it imperative to have a CAPEX reduction. The call of the administration for reduction in investment projects particularly for the transmission sector resulted to additional tasks to be performed such as, various scenarios developed and analysed, optimization run and other related activities.

Nevertheless, it can be said that the schedules for various activities such as DDP - TDP - PDP preparation even so with the NEDA planning, are not harmonized in order to make sure that the required inputs and data and ready for use when needed.

Considering these issues, the whole schedule for the PDP - TDP - DDP preparation needs to be re-evaluated.

Coordination between DOE and TRANSCO for the Preparation of PDP and TDP. The JICA Study Team facilitated the smooth exchange of information between DOE and TRANSCO for the preparation of the TDP and PDP. The Team has also supported the DOE to conduct the economic study on the Leyte-Mindanao interconnection.

The Team has strongly recommended that DOE and TRANSCO hold periodic meetings to coordinate the preparation and implementation of the TDP and PDP. There has been no concrete agreement reached regarding this matter and they remain to coordinate only when necessary. As yet, no internationally accepted standard methodology and/or procedures for power and transmission development planning and coordination under an unbundled power industry has been encountered. There are still much development on-going and each country is trying to develop their own methodology. The DOE and TRANSCO, therefore, should collaborate to strengthen their relationship and develop methodology and good practices leading to effective and efficient power and transmission development planning and management.

On the other hand, TRANSCO is assessing the level of power development required in each area under a scenario without system expansion and reinforcement, as one of the methods to promote power development in desirable areas. The results of the simulation will be included in the TDP2005, and the DOE needs to process the information to develop a policy on power development promotion.

CAPEX Reduction of TRANSCO. TRANSCO needs to apply the N-1 rule to prepare the TDP to comply with the Philippine Grid Code. However, the administration recently ordered the reduction of programmed CAPEX for the transmission sector. Consequently, TRANSCO needs to prioritize projects and this may result to deferment of some projects for several years.

Under the circumstances, a methodology for prioritizing transmission-line projects should be developed. The JICA Study Team proposed principles and methodology to the DOE for prioritization of the projects, considering necessity (e.g. measures against N-0 or N-1) and the impact of faults. The DOE is currently reviewing the Team's recommendation along with other possible determinants.

1.3.3 DDP Formulation

Support to DDP implementation

Pursuant to EPIRA, DUs, which include Electric Cooperatives, (ECs), private investor owned utilities (PIOUs) and LGU-managed utilities, are required to submit their DDP to the DOE not later than March 15 of every year. The IRR of EPIRA does not explicitly provides that DOE is mandated to consolidate the DDPs but rather states that the DDPs will be integrated into the PDP and PEP.

The former JICA Study Team provided assistance to the DOE in preparing data survey forms and in developing procedure for DDP preparation. These tasks are important because of the following reasons:

- DDP is very useful as a data gathering tool for the PDP.
- The distribution network development plan is important as one of the subordinate plans of PDP.
- DUs lack experience in preparing a DDP.

To facilitate the preparation of the DDP, the DOE held a workshop with representatives of the DUs to explain how to accomplish the data collection form. Moreover, the explanation manual was also prepared and disseminated to DUs.

Consequently, the necessary data for the demand forecasting and the PDP were collected through the submission of the DDPs by the DUs.

Issues and Recommendations for DDP preparation

Under EPIRA, each DU has to prepare DDP and submit it to the DOE. This requirement is new, thus, it was perceived that preparation of the DDP would not run smoothly. Below are some concerns regarding preparation of DDPs by DUs:

- DUs have no experience in preparing DDP. Therefore, there are uncertainties regarding the quality of outputs of DUs;
- Some DUs may not prepare the DDP because there is the lack of specific sanction or punishment for non-submission of DDP .

Likewise, the DOE may have difficulties in collecting, processing and consolidating the DUs' DDPs. Below are some specific concerns of DOE with regards to efficient use of the DDPs:.

- The major DUs such as MERALCO (Manila Electric Company) prepared the DDP and submitted it to the DOE in the form of paper document. However, the DOE was not able to process the DDP with this huge volume of paper.
- Time and staff available are insufficient to analyze the huge volume of DDPs;
- The methodology of analyzing the situation of each DU, especially the demand and supply balance, distribution development plan and amount of investment requirement has not been developed.
- The methodology of the demand and supply balance analysis for each island and each area has not been established.

In consideration of the above situation, the JICA study team committed to assist the DOE in achieving the targets below:

1. To ensure efficient and timely collection of DDPs;
2. To effectively and efficiently use the submitted DDPs..

To achieve the first target, the DOE held several regional workshops in 2004 to collect the DDPs and validate the data and information provided by the DUs. To further fine-tune the DUs' submission of their respective DDPs, continuing guidance through conduct of workshops seem necessary for the next 2 or 3 years.

Related to the second target, the DOE used the DDP demand aggregation for the PDP this year. Moreover, the PDP data management system included capability for aggregation of DDPs. This system allows DDP aggregation work to be performed easier and more efficiently.

However, the utilization of DDP should not be limited to the demand forecasting. Corollary to demand forecasting, the DDP presents information that will allow DOE to assess supply and demand outlook and consequently will provide insights on impending crisis in certain areas of the country, such as that in the Panay- Negros island in Visayas area earlier. This will, moreover, enable DOE with other industry participants to identify crisis countermeasures.

It is essential to clarify the uses of the DDP to the DUs in order to highlight the importance of the DDP preparation. Compliance of DUs on submission of DDP to DOE will enable the latter to develop programs, activities and mechanisms that may be useful to DU operations. These activities are the following, but not limited:

- Power plant location planning can be conducted appropriately by the DOE. This allows the DOE to recognize the regional demand and supply balance which may be a basis of regional support.
- The DOE can monitor the financial statements of the DUs. This allows the DOE to support the DUs,if necessary.

On the other hand, the DOE can apply the DDP data to analyze the electricity distribution sector from the regional and national viewpoint as follows:

- The demand comparison between the DDP aggregation and Macro-Econometric method is available in order to analyze the regional demand and supply balance.
- To evaluate the validity of submitted DDP data, the methodology of understanding the relevance of each item is examined.

In 2004, not all DDP were collected in the form of electronic file. By collecting this in electronic format, the PDP data management system can be used for the storage and analysis of data, and further:

- To evaluate, it shall be assumed that the data collection format is used, as well as the method of efficiently understanding the situation of each DUs from their submitted DDP.
- It is necessary to consider the validation of information and data in the DDP, especially the method of the comparative analysis in DUs where the franchise area and the demand level are comparable.

It is thought that the following can be efficiently enforced to continuously accumulate and analyze these data.

- Preparation of DDP with higher accuracy;
- Earlier reporting of a power crisis in an area and a review of the counter measures;
- Support for the investment promotion in distribution power sector, or project establishment.

1.3.4 PDP Data Management System (DMS)

Preparation of PDP DMS

The JICA Study Team developed the PDP Data Management system which aims to facilitate a seamless workflow system which covers data gathering, data analysis and result reporting, based on the DOE requirement. The PDP DMS is a tool that is envisioned to streamline the staff activities related to data/information management and likewise improve quality/accuracy of data and information. used and reported.

The PDP DMS, developed by the JICA Study Team, consists of two applications:

- The application which manages the PDP data and DDP data, hereinafter we refer to as a PDP system
- The application which manages the TDP data comparison analysis, hereinafter we refer to as TDP system

The PDP system supports the data gathering format generation, report generation, search and sort data function, data export/import function and the administration function. TDP system is a simple application which analyzes the difference between two comparative sets of data of the same format. It supports the TDP project profile data and the TDP project progress data.

The PDP DMS has functional capabilities for data gathering, analysis, reporting, and difference comparison, and it is expected to achieve the following:

- Improve the accuracy of data gathering, reduce time for data collection;
- Improve the process for data analysis, and reduce time for data analysis;
- Reduce the manual operation for data collection and processing.

To operate this system, there are several points to be taken into account, such as (1) Directory Management, (2) Security, (3) Output Customization, (4) System Recovery, (5) System Revision. The details of these points will be discussed in Chapter 7.

The JICA Study Team timetable in developing the PDP DMS is shown in Table 1.1:

Table 1.1. PDP DMS Development Schedule, 2004

Period	Activity
up to the end of July	PDP system specification and TDP system specification were finalized through the detailed examination by the JICA Study Team and the DOE.
August to September	PDP System and TDP system design, development, module test.
October	PDP system and TDP system alpha version was released to the DOE to test. The DOE has imported sample data and checked the function of both applications.
November	Final versions of both systems have been released. Manual and specification documentation after training was done.

Issues related to PDP Data Management System

The PDP DMS can perform basic functions necessary to manage the PDP/DDP and the TDP data. Since the responsibility of preparing the PDP has in the pre-EPIRA period been with the NPC, the DOE is still in the process of understanding the basic elements and processes in PDP preparation. The JICA Study Team and the DOE held several consultation meetings in developing and finalizing the PDP DMS system requirement. The system includes all requirements as proposed by the DOE and other functions, such as search function, which have been considered essential and practical based on past experience of the JICA Study Team.

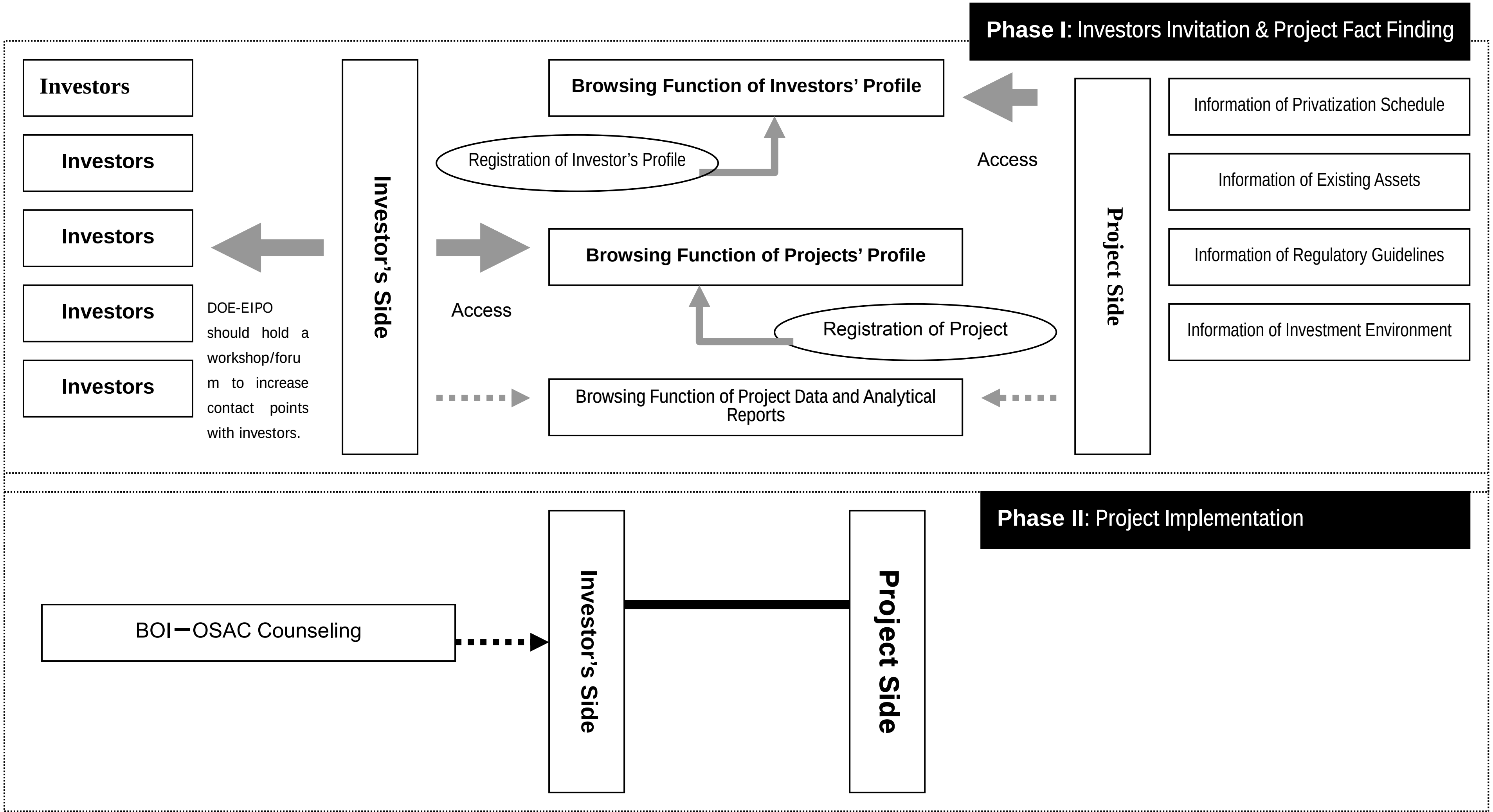
1.3.5 Requirements of the Optimal Energy Investment Promotion Office (EIPO) System

The EIPO system is designed to be the central infomediary system of investment opportunities in the power sector market, so that, as the number of the registered investors and projects increase, more users can enjoy its benefits. It is targeted that with the enhanced EIPO system, there will be more investor registrants and thereby increasing also the number of future users of the system. Information dissemination activities must be undertaken by DOE to introduce and promote the concepts and principles behind the development of the EIPO System.

The DOE has also initiated the development of a comprehensive information system for the monitoring and evaluation of the electric power industry reforms. This is called the “EPIRA Power Tracker” of which the initial development was supported by the United States Agency for International Development (USAID). The Power Tracker is still in the developmental stage. All these parallel efforts on information system development should be spearheaded by the DOE and should be building upon the on-going activities by partner agencies.
In the area of encouraging private investors in the country’s electric power industry, the DOE’s challenge is to develop and launch an investor friendly EIPO system and at the same time

conduct workshops or practical forums to establish contacts with as many potential investors as possible.

Table 1.2 Framework of the Future Optimal EIPO System and its Contents



1.3.6 Capacity Building for DOE

Assessment of Current DOE Capability

The activities undertaken by the team strengthened the capability of the DOE-EPIMB in the following areas of work:

Short-term objective: To consolidate the institutional form and human resources to formulate the proceeding PDP

- With regard to demand forecasting and PDP, the DOE can conduct the demand forecasting and PDP in the next year by themselves. However, the DOE is not yet ready to conduct the optimal siting of power plants nor Power flow analysis by themselves;
- With regard to evaluation of TDP, the person in charge had to spend time to evaluate the transmission line project in advance of the evaluation of TDP, and that person could not spend enough time on evaluating TDP.
- With regard to DDP aggregation, the DOE is fully capable of handling the review and consolidation of the DDPs.

Overall, the capability and skills of the DOE staff to perform related tasks have been improved dramatically However, the number of staff is still not sufficient to undertake the required review and analytical studies. This is a serious problem the DOE is facing in preparing PDP independently.

Medium and longer term objective: To establish the institutional form needed to implement the capacity building within the DOE for the necessary self-improvement.

With regard to the structure of the capacity building for the DOE, the proposal is outlined in Chapter 9.

The continuing lack of personnel results to (1) weakness of the self-development in the DOE and (2) lack of staff to take over the skill to the other.

Issues and Recommendations for Capacity Building in DOE

There is a limit to the period of the JICA Study Team support. Sufficient technical skill is provided to the DOE. However, the institutional capability may deteriorate in the near future because of possible transfer or retirement of staff trained by the JICA Study Team. To avoid such deterioration, and to improve such capability, sustainable capacity building within the DOE is necessary.

In order to conduct the sustainable capacity building in the DOE, a Training Program for internal capacity building in the DOE was prepared. Table 1.3 shows the elements of the plan.

Table 1.3 Target Level for the Capacity Building

Activity	Necessary Input	Target Date
To provide the necessary assistance in the preparation of PDP	Assistance in PDP preparation on at least one occasion, plus self-study using the relevant materials.	At the end of the first year.
To prepare the PDP	PDP preparation at on at least one occasion, plus self-study by using the relevant materials.	At the end of the second year.

The sustainable capacity building plan for the DOE consisted of distribution of training materials and on-the-job training in the preparation for the PDP (discussed in Section 9.3).

2. Status of Electric Power Industry Reforms in the Philippines

The Philippine Electric Power Industry is at the crossroad towards full structural and regulatory reforms. The main policy and institutional frameworks for the reform of the electric power industry are embodied in the Republic Act No. 9136 or the Electric Power Industry Reform Act of 2001 (EPIRA). The Law essentially aims to establish a more competitive and responsive electricity market that shall hopefully provide better electricity services to the Filipinos at competitive electricity prices in the long run. This chapter outlines the key reforms laid down by the EPIRA and the status of their implementation under the oversight of the DOE.

2.1 Institutional and Restructuring Reforms

The EPIRA espouses institutional and restructuring reforms that are requisite in modernizing and developing a competitive electricity market in the country. The major institutional reforms implemented to date include the following:

- Reorganization of the DOE and the creation of the EPIMB within the DOE that will perform DOE's mandate as provided in the EPIRA of 2001 and its Implementing Rules and Regulations (IRR);
- Creation of the Energy Regulatory Commission (ERC) to replace the then Energy Regulatory Board (ERB). EPIRA and the IRR vested ERC with overall regulatory functions over all industry participants in the generation, transmission, distribution and supply sectors;
- Creation of the Power Sector Assets and Liabilities Management Corporation (PSALM). The PSALM , as envisaged in the EPIRA and the IRR, will be the owner of NPC's generation and transmission assets subject to the concurrence and approval of NPC's creditors. PSALM shall also manage the orderly and transparent privatization process of the NPC assets, among other functions. The status of various activities being spearheaded by PSALM are discussed in the proceeding section;
- Functional and structural unbundling of the industry primarily the NPC. From a vertically integrated generation and transmission company, NPC was unbundled resulting to the creation of the TRANSCO to manage and operate the transmission assets of NPC. The original NPC was streamlined and is now mandated to operate the unprivatized generation assets and hydroelectric power plants under the oversight of PSALM.

The functional and structural unbundling of the industry will be implemented into levels: macro and micro. The macro functional and structural unbundling will result to distinct and independent power industry sectors, namely the generation, transmission, distribution and supply sectors. The DOE and ERC are responsible for developing and implementing policies and regulations for each of the sectors. The micro-level functional and structural unbundling refers to the separation of books and records of a single business entity into its various power industry activities. The notable accomplishment for the micro-level functional/structural unbundling was that of the NPC. Other industry participants are still in the process of separating their books and records to comply with the guidelines as set by the ERC.

2.2 Market Operation Reforms

There are two major market-related reforms currently being implemented for the electric power industry. These are: (1) the establishment of the Wholesale Electricity Spot Market (WESM) which aims to develop competition in the generation sector; and, (2) the Open Access and Retail Competition, which is hoped to develop a price-responsive retail market in the country. The strong linkage of these reforms will be necessary to push the industry into a more competitive regime.

2.3 The Philippine Wholesale Electricity Spot Market (WESM)

The key feature of the power industry restructuring is the introduction of competition in generation, which will change the landscape of the current tariff practice from a regulated regime to a competitive one. To make this pricing structure work, a spot market for electricity must be established to determine the economic value of electricity on an hourly basis. It is envisioned that with the establishment of the Philippine WESM, the price of electricity will approach the level of marginal cost in the short run. WESM is a mechanism for competitive electricity trading leading to a more efficient power sector and more competitive electricity prices. It will be the single venue for trading of electricity wherein the generators sell their power in a competitive price while giving access to buyers of electricity.

2.3.1 The WESM Rules

The DOE, jointly with the industry participants, established the WESM Rules and was later approved and promulgated by the ERC last June 28, 2002 in accordance with the provisions of EPIRA. The WESM Rules prescribe the basic rules, requirements and procedures that govern the operation of the Philippine electricity market. The WESM Rules are intended to be used with the Philippine Grid and Distribution Codes to ensure the development of an appropriate, equitable and transparent electricity market, and reliable, safe, and efficient operation of the power system.

The Market will consist of both wholesale spot market trading and bilateral contracting in the form of financial hedging against foreseen price volatility in the market. This means that all wholesale transactions, even within or outside the spot market, shall be included for the determination of the most economical central dispatch of the grid systems. The bilateral contracts, therefore, are respected in the WESM regime as a form of "contract for difference".

Once the WESM is established, all plants will be centrally scheduled and dispatched in merit order, based on the ranking of bids and offers for electricity submitted by the WESM participants in accordance to the ERC-approved WESM Rules.

Creation of WESM - Technical Working Group (WESM-TWG)

In accordance with the WESM Rules, the DOE issued in July 2002 the Department Order No. 2002-07-010 creating the WESM-TWG, which is headed by the DOE and composed of representatives from industry participants. WESM-TWG is responsible for ensuring a smooth transition from promulgation of the WESM Rules to actual commercial operation of the spot market and, among others, is tasked to: (i) monitor the implementation of the WESM Rules; (ii) the design of the market network model; (iii) formation of the Autonomous Group Market Operator (AGMO); and, (iv) review of the price determination methodology (PDM) for WESM.

To date, WESM-TWG, in conjunction with the TRANSCO-MO unit, has been instrumental for the conduct of the following: (i) development of rules and regulations relative to billing & settlements, market operations, and system operations under the WESM; (ii) development of rules and regulations for the metering covering Revenue Metering Hardware Installation Standards, Metering Site and Equipment Identification; and, (iii) Review of the WESM PDM consistent with Rule 9, Sec. 5(d) EPIRA-IRR and the WESM Rules.

2.3.2 Establishment of the Philippine Electricity Market Corporation (PEMC)

The DOE, through the WESM-Technical Working Group (TWG), constituted the Philippine Electricity Market Corporation (PEMC) in 2003. with equitable representation from electric power industry participants as an autonomous group market operator that will undertake the preparatory work and initial operation of the WESM (Figure 2.1). PEMC serves as an independent governing body that will oversee the System Market Operator (MO) presently under the administrative supervision of TRANCO.

In constituting the PEMC, the DOE in collaboration with the WESM-TWG developed the Articles of Incorporation and By-laws of the PEMC in consultation with industry participants. On 4 September 2003, the WESM-TWG adopted and approved the incorporation documents for submission to the Securities and Exchange Commission (SEC). The PEMC is now duly incorporated as a non-stock, non-profit corporation with the issuance of SEC Certificate of Incorporation on 19 November 2003.

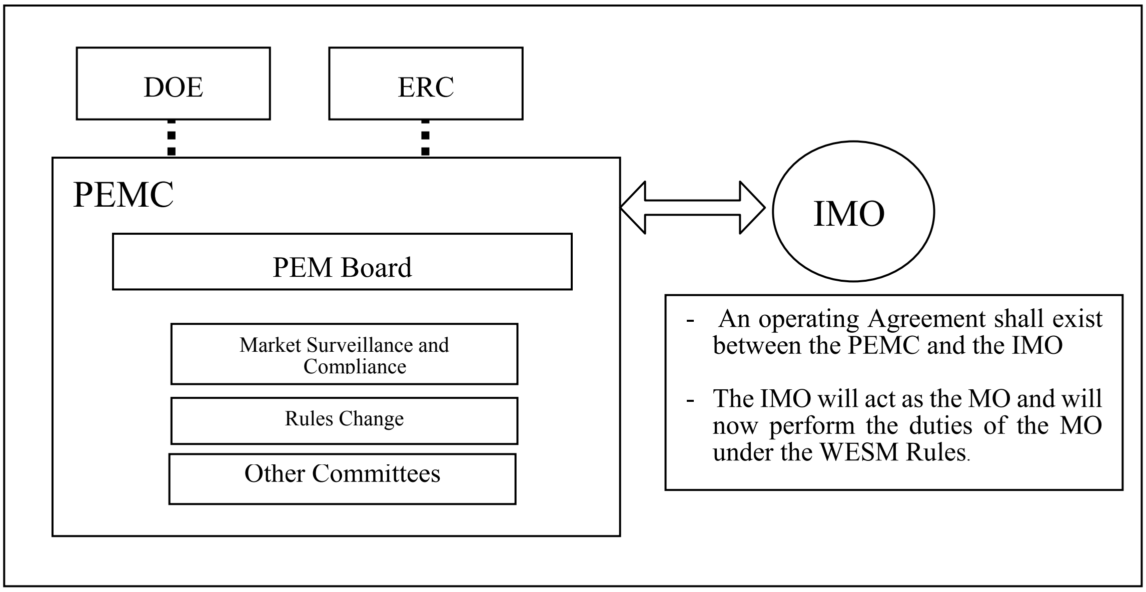


Figure 2.1 Role of PEMC in the WESM Implementation

Source: PEMC

2.3.3 The WESM Market Management System (MMS)

On 17 March 2004, The turnkey implementation of the Market Management System (MMS) was awarded to the Asea Brown Boveri (ABB), while the Consultancy Services for the Project Management System was awarded to the Marketplace Company. This was made possible by the concessionary loan from Asian Development Bank (ADB) through the ADB Loan in 1984 "Electricity Market and

Transmission Development Project". The project covered both the financing of the project consultancy services and the software and hardware for the MMS. The functional details of the MMS are shown in Table 2.1.

At present, the prototype design of the MMS has already been delivered to the PEMC. Although still limited, the said prototype has been used in the conduct of market readiness activities such as hands-on trainings and seminars for the industry participants during the year.

Table 2.1 Functionality of the MMS

MMS MODULE	FUNCTIONALITY
Market Infrastructure	- EMS-MMS Interface
Market Applications	- Customization with the WESM Rules - Load forecasting
Hardware	- To be supplied by the Hewlett Packard - Outsourcing of MMS security system from PKI
Settlement	- Provided by NAVITA - No accounting interfaces provided to date
Accounting	- To be provided by GIS, a Philippine-based company
Metering	- To be provided by ITRON
Market Infrasture	- Web-based Participant Interface - Participant registration - Uploading of bids and offers - Publications of Market information and settlement
Market Applications	- Customization with the WESM Rules - Load forecasting - Calculates prices and schedules for Day-Ahead, Week-Ahead and Real-time Markets
Settlemen	- Calculation of hourly transaction - Electronic Fund Transfer interface
Accounting	- Transaction and volume accounting
Meter Data Warehouse	- Validation and storage of meter data - Settlement ready meter data

Source: PEMC

2.3.4 Updated Timeline of WESM Implementation

The WESM site is at the 9th Floor of Robinson's Equitable Tower, Ortigas Center, Pasig City, which is also the home of the PEMC and the TRANSCO-MO(Market Operator). Recently, PEMC announced that the Philippine WESM Infrastructure Site is already all set for the forthcoming delivery and installation of the hardware and software components of the MMS. Preparations are also now being made for the registration of the WESM participants, which will commence by December 2004. The market trial operation of the WESM in Luzon is set in June 2005 to test the rules, systems and procedures of the WESM, as well as ensure market participants' readiness (Figure 2.2). The commercial operation of WESM will take place in December 2005.

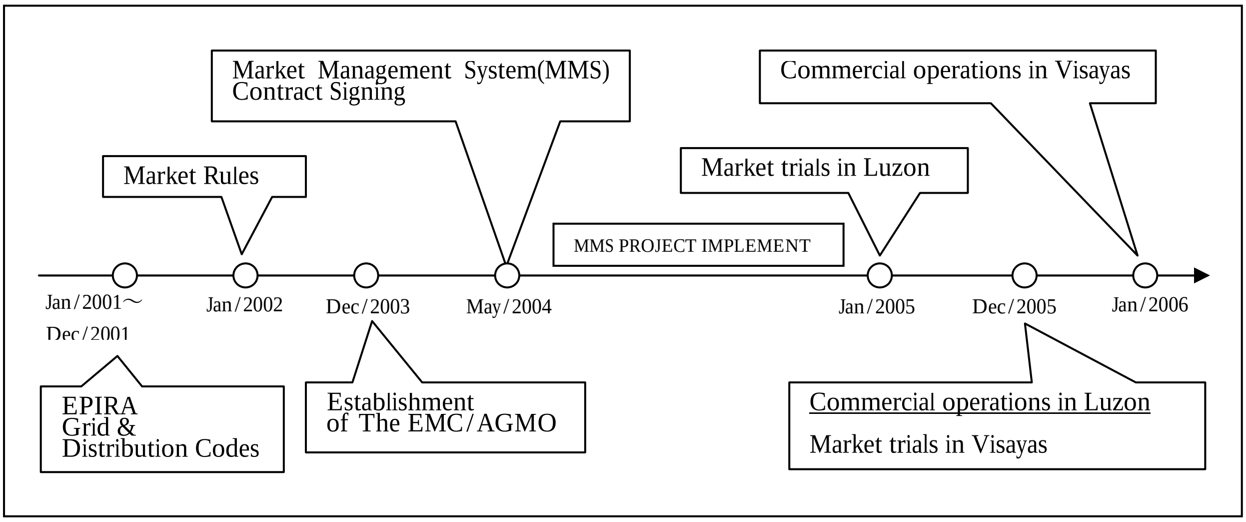


Figure 2.2 Timeline for WESM Implementation

Source: PSALM

Retail Competition And Open Access

Competition at the supply or retail level, where every consumer has the power to choose his source of electricity, is the end step of the electricity reform in the Philippines. Section 31 of EPIRA specified five (5) conditions necessary for open access to take place, namely: (1) establishment of the WESM; (2) unbundling of transmission and distribution wheeling charges; (3) initial implementation of the cross subsidy removal scheme; (4) privatization of at least 70% of the total capacity of generating assets of NPC in Luzon and Visayas; and, (5) transfer of NPC-IPP contracts to IPP Administrators. Realizing the need to determine the status on the implementation of retail competition, ERC conducted a forum on the preparation for retail competition last August 23, 2004 to gain insights on the realistic and achievable timetable for the commencement of retail competition. Based on the briefing made by PEMC on WESM and PSALM on the status of the privatization of NPC assets, the ERC has recently issued the Resolution No. 2 dated 21 September 2004 prescribing the timeline for the implementation of retail competition and open access.

Retail competition and open access shall commence in the Luzon Grid by 1 July 2006 and January 1, 2007 for Visayas. Upon the initial implementation, the ERC will allow all electricity end-users with a monthly average peak demand of 1 MW for the first twelve (12) months as the contestable market. Two (2) years after, the threshold level will be reduced to 750 kW. At this level, aggregators will be allowed to supply electricity to end-users whose aggregate demand within the contiguous area is at least 750 kW. The entry of aggregators will provide the end-users venue to choose their own supplier.

Subsequently and every year thereafter, the ERC will evaluate the performance of the market. On the basis of such evaluation, it will gradually reduce threshold level until it reaches the household demand level.

In the case of electric cooperatives, retail competition and open access will be implemented not earlier than five (5) years upon the effectivity of EPIRA.

The initial estimates of the contestable market is about 546 customers, mostly directly-connected customers of NPC. Most of these customers are industrial and commercial customers which are located in Luzon grid.

Open Access Transmission Service

Even prior to the passage of EPIRA, the NPC has been implementing open access to its transmission facilities as early as 1997 to allow the entry of private generating facilities into the major grids. In the absence of detailed policies for open access, NPC was able to secure the Energy Regulatory Board's (now ERC) approval of the applicable tariff. With the enactment of EPIRA, TransCo has been mandated, even prior to the transfer of the transmission functions to it by NPC, to provide all electric power industry participants open and non-discriminatory access to the transmission system. The set of TransCo's comprehensive policies on open access is contained in the Rules, Terms, and Conditions for the Provision of Open Access Transmission Service (OATS Rules) approved by the ERC on February 11, 2004. The OATS Rules will allow for the smooth transition to the wholesale market structure, while ensuring consistency with the industry's technical, legal, and regulatory framework.

The OATS Rules serve as the framework of TransCo's open access mandate. As such, it must adapt to the changes in the industry, particularly the shift to wholesale electricity spot market. The OATS must distinguish between services that TransCo needs to provide only under the old structure, for the transition period prior to establishment of the spot market, and those that it will continue to provide once the spot market and the restructuring are in place. Under the OATS regime, ancillary services are deemed provided by the dominant generator, i.e., the NPC. TransCo, on the other hand, is responsible for ensuring that appropriate amounts of these ancillary services are available for reliability. At the same time, TransCo is responsible for collecting from transmission customers the payment for the ancillary services in accordance with the ERC-approved rates.

Prior to the commencement of WESM, TransCo, as the SO, in consultation with the MO, is tasked to develop procedures in relation to any competitive tendering process for ancillary services. This is intended for ancillary services where competition is possible. In addition, TransCo will develop ancillary service arrangements, interim market contract requirements, and cost recovery formula, all of which are contained in this Procurement Plan.

Development of Competition Rules

As mandated by EPIRA, ERC has formulated the Competition Rules that defines the framework for the market competition and consumer choice and specific types and corresponding penalties for anti-competitive practices including undue discrimination, abuse of market power and unfair gaming. ERC conducted public hearings since early March 2004 to finalize the rules.

2.4 Privatization of NPC generation Assets

The privatization of existing NPC generating assets both in the main and island grids will also allow for the greater participation of the private sector in the industry. It will enhance the inflow of private capital and broaden the ownership base of the generation sector. In preparation for the retail competition, at least 70 percent of the NPC generating capacities shall be offered to the private sector through competitive bidding.

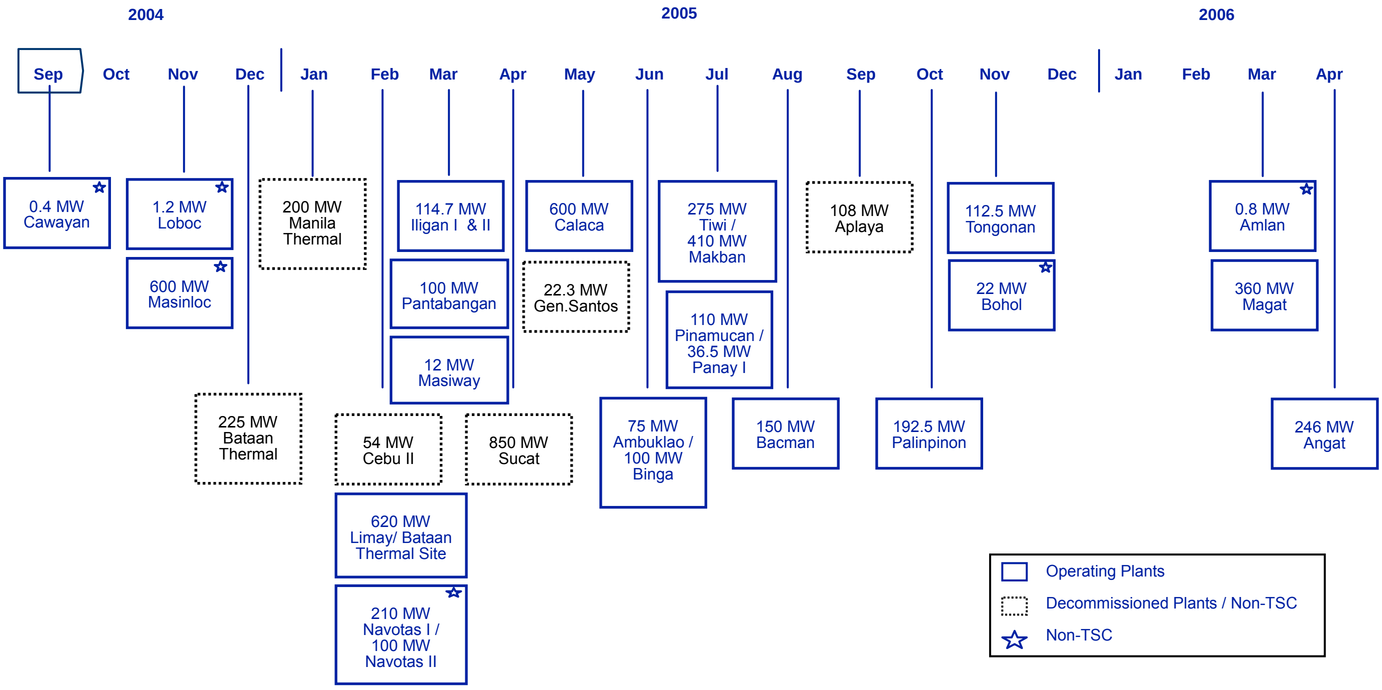


Figure 2.3 Privatization of NPC Generation Assets*

*As of November 2004

Source: PSALM

Pres. G.M. Arroyo has approved the privatization plan submitted by the PSALM. The EPIRA, however, restricts ownership, operation or control of a single entity to 30% of the installed generation capacity within the grid or 25% at the national level to promote true market competition and prevent harmful monopoly and market power abuse.

Since the publication of the generation plants for competitive bidding, at least six generation assets have already been sold successfully to the private sector while about 22 plants are now undergoing competitive bidding.

The six power plants successfully bidded out to the private sector from March-November 2004 has total installed capacity of 608.5 MW amounting to US$566.948 Million. They are as shown in Table 2.2.

Table 2.2 Transaction Comparators*

Plant	Plant Type	Location	Size [MW]	Winning Bid [$000s]	$ / kW	$ / kW / Year Rem. Life
Talomo	Hydro	Davao	3.5	1,370	391	20
Agusan	Hydro	Bukidnon	1.6	1,528	955	19
Barit	Hydro	Camarines Sur	1.8	480	267	11
Cawayan	Hydro	Sorsogon	0.4	410	1,026	51
Loboc	Hydro	Bohol	1.2	1,420	1,183	53
Masinloc	Coal	Zambales	600	561,740	936	39
Total			608.5	566,948	-	-
Average weighted by kW size			-	-	932	39

*As of November 2004
Source PSALM

The generation assets target sale is about 30% by end of 2004, and at least 70% target sale by end of 2005. To achieve this, PSALM need to efforts to follow an accelerated sale sequence, in consultation with concerned agencies and considering investor feedback.

Similarly, the PSALM is also gearing for the transfer of the management and control of at least 70% of the total energy output of power plants under contract with NPC to the Independent Power Producer (IPP) administrators. The transfer to IPPs is expected to take place in January 2006. The initial draft of Terms of Reference (TOR) for the IPP administrators, Eligibility Document and Instruction to Bidders were already completed. The PSALM and its advisors are currently reviewing the implementation details.

2.5 Privatization of NPC Transmission Assets

Privatization of the TRANSCO

Section 9 of EPIRA also requires TRANSCO, as the system operator, to provide central dispatch of all generation facilities and provide open and non-discriminatory access to its transmission system to all electricity users.

PSALM is also mandated to facilitate the privatization of the transmission assets of TRANSCO. EPIRA provides that TRANSCO's facilities, including grid interconnections and ancillary services, will be privatized with the objective of maximizing the present value of the proceeds to the government while attracting qualified investors. The law allows for privatization through a concession contract.

The approved privatization plan for TRANSCO is in the form of a concession, which is effectively a 25-year lease of the transmission assets and automatically renewable for another 25 years provided that concessionaire is not in the breach of the concession agreement. Both the first and second rounds of public bidding were declared failure by the Pre-qualification Bids and Awards Committee in July and August 2003, respectively, considering that only one party submitted an Expression of Interest. After two failed bids, PSALM Board has authorized the PSALM Management to initiate negotiation with qualified interested/parties. In September 2004, PSALM opened the discussions with qualified, interested parties on the concession agreement for the operation of TRANSCO. Five interested parties have submitted non-binding term sheet proposals as basis to initiate negotiations.

PSALM is now evaluating the term sheets submitted by five interested proponents. These proponents have already gone around some TRANSCO facilities and conducted dialogues with TRANSCO officers. Upon evaluation, PSALM will issue a short list and proceed with the negotiations. The government plans to put a concessionaire in place by December of this year.

Divestment of Sub-Transmission Assets

EPIRA also provides that the sub-transmission assets will be operated and maintained by TransCo until their disposal to qualified DUs that are in a position to take over the responsibility for operating, maintaining, upgrading and expanding said assets. The sale of TransCo's sub-transmission assets involves some 120 sale packages that concern 115 interested DUs, mostly ECs. There are cases where more than one DU is connected to a transmission line, in which case, there is a need for the connected and qualified DUs to form a consortium. The sub-transmission assets include a total of 7,500 circuit-kilometers of mostly 69kV transmission lines and 1,600 MVA of substation capacity. Estimated cost of these assets is at PhP 9 billion.

As of end of June 2004, the inspection and inventory of the sub-transmission assets have already reached about 60% of the total sale packages. Negotiations are ongoing with DUs which have submitted documents for financial and technical evaluation. Payment terms for private utilities have already been set. Electric cooperatives have the option for an outright purchase on a cash basis or they could avail of the lease purchase financing being offered by TransCo or they could avail of funds from other financial institutions. For the period January – June 2004, three sub-transmission sale packages were sold to three DUs.

3. Electric Power Demand Forecasting

3.1 Demand Forecasting Using Econometric Model

3.1.1 Assumptions of the Econometric Model

The JICA Study Team revisited the assumptions used in the demand forecasting done last year. Consequently, the Team together with the DOE defined and updated some of the assumptions and there are the following:

- Update estimation of future Gross Regional Domestic Product (GRDP) shares among regions. In Mindanao, historical GRDPs in Region X, Region XII, CARAGA and ARMM are merged. Then future GRDP shares in Mindanao for those areas were forecasted as one region. That treatment was done because historical data of each GRDP in those areas was unsteady. This approach resulted to steadier GRDP for the region as defined here.
- Review EC regional groupings in Mindanao. The validated EC groupings was applied to regression models in Macro approach.
- Sales data in year 2002 and 2003 of each PIOU and EC are collected from ERC and NEA. In the next PDP process, sales data for 2004 will be collected from DDP data collection system.
- AF (Adjustment Factor) and LF (Load Factor) for each area are updated considering NPC statistics regarding its recent 5 years sales kW and MWh data. The results are on the next Table.

Table 3.1 Updated AF and LF

Grid	AF (Adjustment Factor)		LF (Load factor)	
Luzon	23%	NPC Direct Sales 7% Transmission Loss 8% Self consumption in Station 8%	62%	5 years average 61.6%
Visayas	33%	NPC Direct Sales 7% Transmission Loss 8% Self consumption in Station 8%	50%	5 years average 49.6%
Mindanao	40%	NPC Direct Sales 7% Transmission Loss 8% Self consumption in Station 8%	58%	5 years average 57.4%

The start point of demand growth curve, that is the system peak in 2003 for each area, is defined by the DOE based on DDP data and information from system operators. System peak demand can be calculated by adding embedded demand to TRANSCO peak. In previous PDP, these embedded demand were based on TRANSCO's survey result. But in PDP 2005, the system peak demand is estimated by the DOE and the JICA Study Team based on information regarding to embedded generation from the DDP) and direct information provided by the System Operator.

Table 3.2 System Operators Peak and Embedded demand , PDP2005

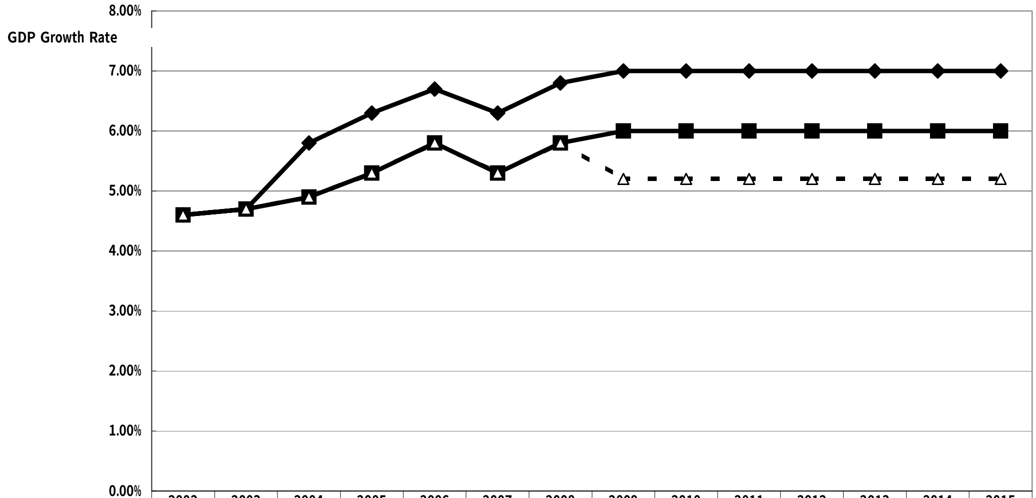
	SO Peak	Embedded (Estimated)	Total
Luzon	6,149	198	6,347
Visayas	924	108	1,032
Mindanao	1,131	35	1,166
Philippines	**8,204**	**342**	**8,546**

3.1.2 GDP assumption

NEDA disclosed new GDP forecast in the middle of September 2004. The GDP 2004 forecast is higher than the GDP forecast in 2003; especially, after year 2007, each scenario is 1 point higher than previous GDP scenario. The bullish GDP forecasts in 2004 will result to higher demand growth assumption in the macro approach using the econometric model.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NEDA High GDP CASE	4.60%	4.70%	5.80%	6.30%	7.30%	7.50%	7.80%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
NEDA Low GDP CASE	4.60%	4.70%	4.90%	5.30%	6.30%	6.50%	6.80%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
LOWER GDP Modificated CASE	4.60%	4.70%	4.90%	5.30%	6.30%	6.50%	6.80%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%

Figure 3.1 New GDP forecast released by NEDA in September 2004



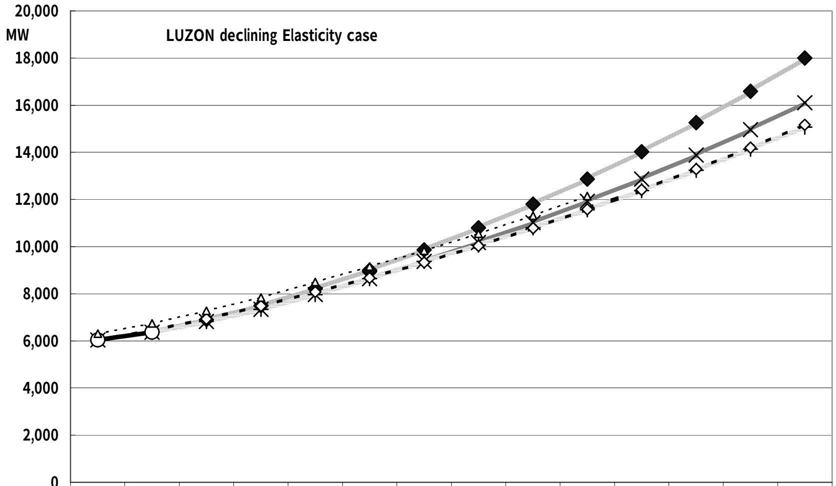
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NEDA High GDP CASE	4.60%	4.70%	5.80%	6.30%	6.70%	6.30%	6.80%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
NEDA Low GDP CASE	4.60%	4.70%	4.90%	5.30%	5.80%	5.30%	5.80%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
LOWER GDP Modificated CASE	4.60%	4.70%	4.90%	5.30%	5.80%	5.30%	5.80%	5.20%	5.20%	5.20%	5.20%	5.20%	5.20%	5.20%

Figure 3.2 GDP forecast released by NEDA in May 2003

3.1.3 Overview of the PDP 2005 Results: Macro Approach (using Econometric Model)

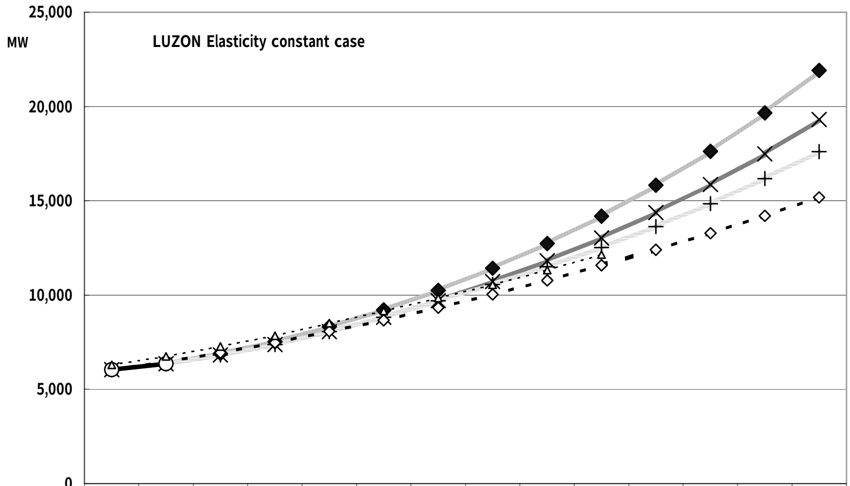
Demand Growth in each Area

The results for main grids based on assumptions above are shown on the following figures (Figure.3.1 – Figure.3.8). From the results, future demand growth in each area is described below:
(i) Luzon. The forecasted demand (Low GDP, declining elasticity) is a little higher than the previous forecast (PDP2004) and the result in PDP2004 is almost same as modified LOW GDP, declined elasticity case. This result means growth of consumption per GDP is not so different from the previous result and the difference between the previous and new forecast only depends on difference of scenario of GDP growth.
(ii) Visayas. Also, the forecasted demand (Low GDP, declining elasticity) is a little higher than the last year forecast; the variance is very small. The demand growth between year 2002 and 2003 is not so large as expected. This can be attributed to the observed little effect of GDP scenario change in Visayas than in Luzon.
(iii) Mindanao. There is some confusion on ECs regional groupings in historical data. Also, in 2003, Mindanao experienced high peak demand growth. Due to both factors, forecasted demand growth in Mindanao becomes significantly higher than the result of previous study. Actual peak demand of 1166MW in 2003 is almost same level as projected year 2005's peak demand in the previous study. This case will result to higher demand forecast for the 10 year period.



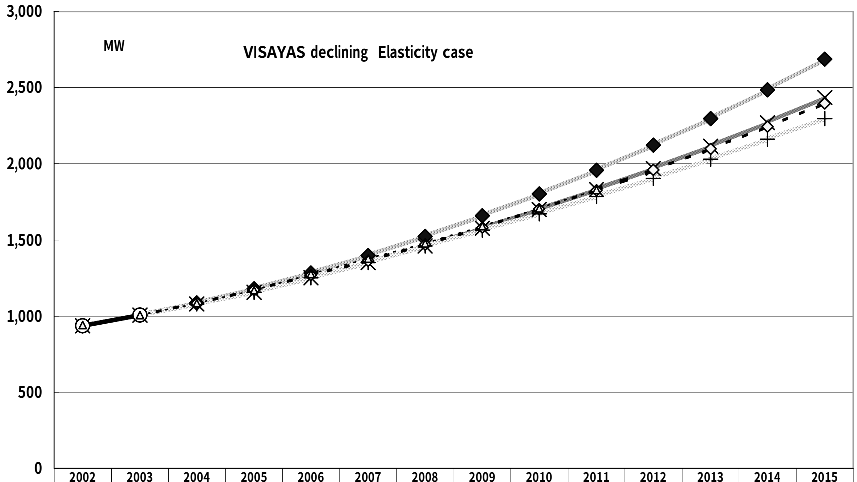
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NEDA High GDP CASE Luzon	6,039	6,365	6,899	7,498	8,215	8,994	9,853	10,791	11,796	12,871	14,023	15,258	16,582	18,002
NEDA LOW GDP CASE Luzon	6,039	6,365	6,829	7,343	7,964	8,635	9,372	10,171	11,018	11,917	12,871	13,884	14,959	16,103
LOWER GDP Modified CASE Luzon	6,039	6,365	6,829	7,343	7,964	8,635	9,372	10,069	10,802	11,572	12,382	13,234	14,131	15,074
PEP2004 LOW GDP Declined elasticity Case Result 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
Luzon Actual	6,039	6,365												
PEP2003 Result	6,308	6,752	7,275	7,835	8,503	9,161	9,830	10,548	11,319	12,149				

Figure 3.3 Demand forecasting results in Luzon (Decline Elasticity Cases)



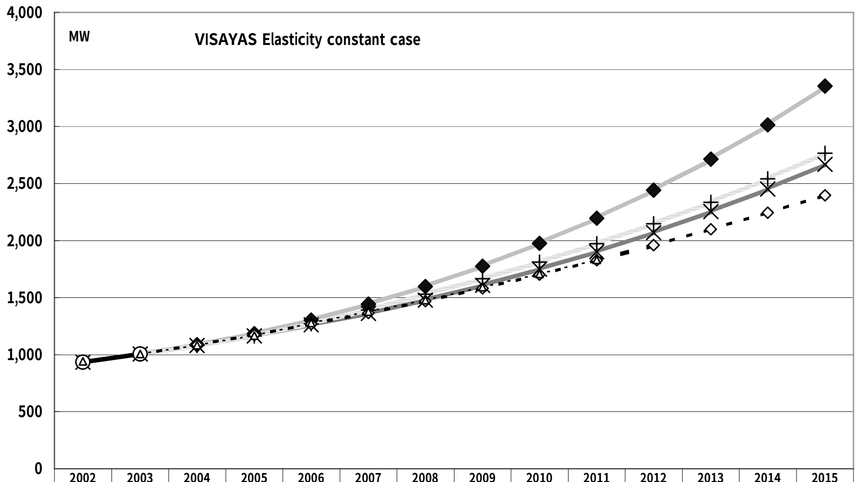
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NEDA High GDP CASE Luzon	6,039	6,365	6,899	7,526	8,315	9,211	10,242	11,418	12,728	14,189	15,817	17,632	19,655	21,911
NEDA LOW GDP CASE Luzon	6,039	6,365	6,829	7,366	8,052	8,824	9,709	10,710	11,815	13,033	14,377	15,859	17,494	19,298
LOWER GDP Modified CASE Luzon	6,039	6,365	6,829	7,366	8,052	8,824	9,709	10,570	11,508	12,529	13,641	14,851	16,168	17,602
PEP2004 LOW GDP Declined elasticity Case Result 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
Luzon Actual	6,039	6,365												
PEP2003 Result	6,308	6,752	7,275	7,835	8,503	9,161	9,830	10,548	11,319	12,149				

Figure 3.4 Demand forecasting results in Luzon (Constant Elasticity Cases)



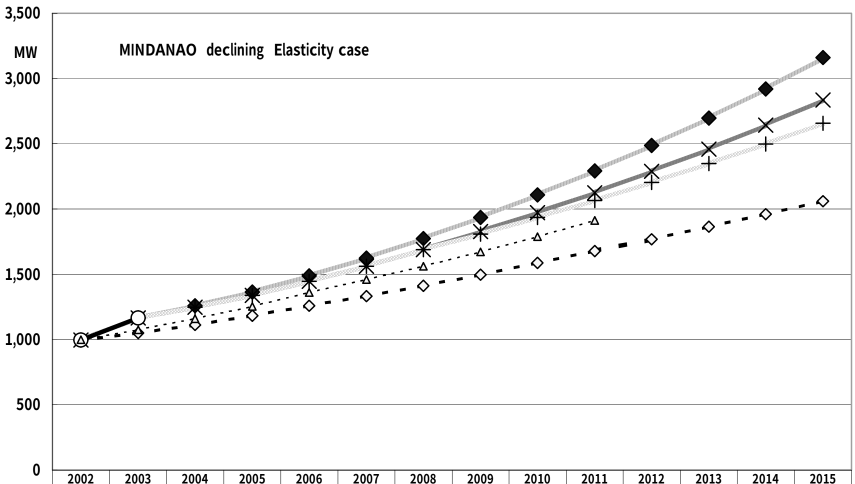
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NEDA High GDP CASE Visayas	936	1,006	1,088	1,178	1,284	1,398	1,523	1,658	1,803	1,957	2,122	2,297	2,486	2,687
NEDA LOW GDP CASE Visayas	936	1,006	1,078	1,158	1,251	1,351	1,460	1,577	1,700	1,831	1,969	2,115	2,270	2,434
LOWER GDP Modified CASE Visayas	936	1,006	1,078	1,158	1,251	1,351	1,460	1,563	1,672	1,785	1,904	2,029	2,160	2,297
PEP2004 LOW GDP Declined elasticity Case Result 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
Visayas Actual	936	1,006												
PEP2003 Result	941	1,007	1,084	1,168	1,276	1,377	1,477	1,592	1,707	1,829				

Figure 3.5 Demand forecasting results in Visayas (Decline Elasticity Cases)



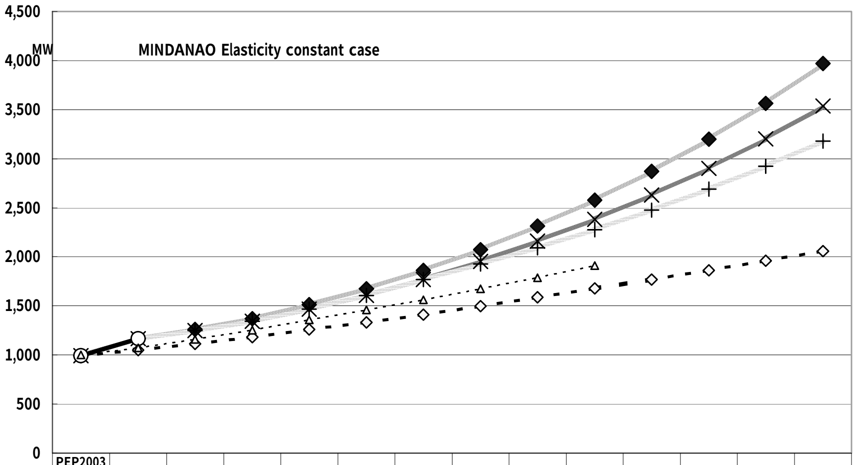
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NEDA High GDP CASE Visayas	936	1,006	1,088	1,183	1,304	1,441	1,598	1,776	1,974	2,195	2,440	2,712	3,015	3,352
NEDA LOW GDP CASE Visayas	936	1,006	1,078	1,163	1,262	1,360	1,476	1,607	1,748	1,903	2,071	2,253	2,452	2,668
LOWER GDP Modified CASE Visayas	936	1,006	1,078	1,163	1,270	1,391	1,530	1,665	1,812	1,972	2,146	2,335	2,541	2,765
PEP2004 LOW GDP Declined elasticity Case Result 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
Visayas Actual	936	1,006												
PEP2003 Result	941	1,007	1,084	1,168	1,276	1,377	1,477	1,592	1,707	1,829				

Figure 3.6 Demand forecasting results in Visayas (Constant Elasticity Cases)



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NEDA High GDP CASE Mindanao	995	1,166	1,260	1,364	1,490	1,625	1,774	1,935	2,108	2,292	2,488	2,697	2,921	3,160
NEDA LOW GDP CASE Mindanao	995	1,166	1,247	1,337	1,445	1,562	1,689	1,827	1,972	2,126	2,288	2,460	2,642	2,834
LOWER GDP Modified CASE Mindanao	995	1,166	1,247	1,337	1,445	1,562	1,689	1,809	1,935	2,066	2,204	2,348	2,499	2,658
PEP2004 LOW GDP Declined elasticity Case Result 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
Mindanao Actual	995	1,166												
PEP2003 Result	1,000	1,074	1,159	1,254	1,360	1,459	1,563	1,673	1,789	1,912				

Figure 3.7 Demand forecasting results in Mindanao (Decline Elasticity Cases)



	PEP2003 Result													
NEDA High GDP CASE Mindanao	995	1,166	1,260	1,371	1,513	1,675	1,861	2,075	2,312	2,577	2,871	3,199	3,564	3,970
NEDA LOW GDP CASE Mindanao	995	1,166	1,247	1,342	1,467	1,608	1,770	1,955	2,158	2,382	2,630	2,903	3,204	3,536
LOWER GDP Modified CASE Mindanao	995	1,166	1,247	1,342	1,467	1,608	1,770	1,925	2,094	2,276	2,475	2,691	2,925	3,180
PEP2004 LOW GDP Declined elasticity Case Result 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
Mindanao Actual	995	1,166												
PEP2003 Result	1,000	1,074	1,159	1,254	1,360	1,459	1,563	1,673	1,789	1,912				

Figure 3.8 Demand forecasting results in Mindanao (Constant Elasticity Cases)

Demand Growth of each Island in Visayas

Demand forecasting results for each island in Visayas are shown in Figure, 3.10 –Figure 3.15. Figure 3.9 below presents the comparative demand growth 2004 – 2005 forecasts for each island in Visayas. As mentioned before, demand forecasting in Visayas grid is not so different from the previous study in PDP2004. Therefore, generally each island peak forecasting result is also not so different from the previous. However, demand forecast result for Cebu is a little higher than the previous forecasted result. On the other hand, demand forecast result for Leyte-Samar is lower than the results of the previous year study. The results were strongly affected by the actual peak in year 2003.

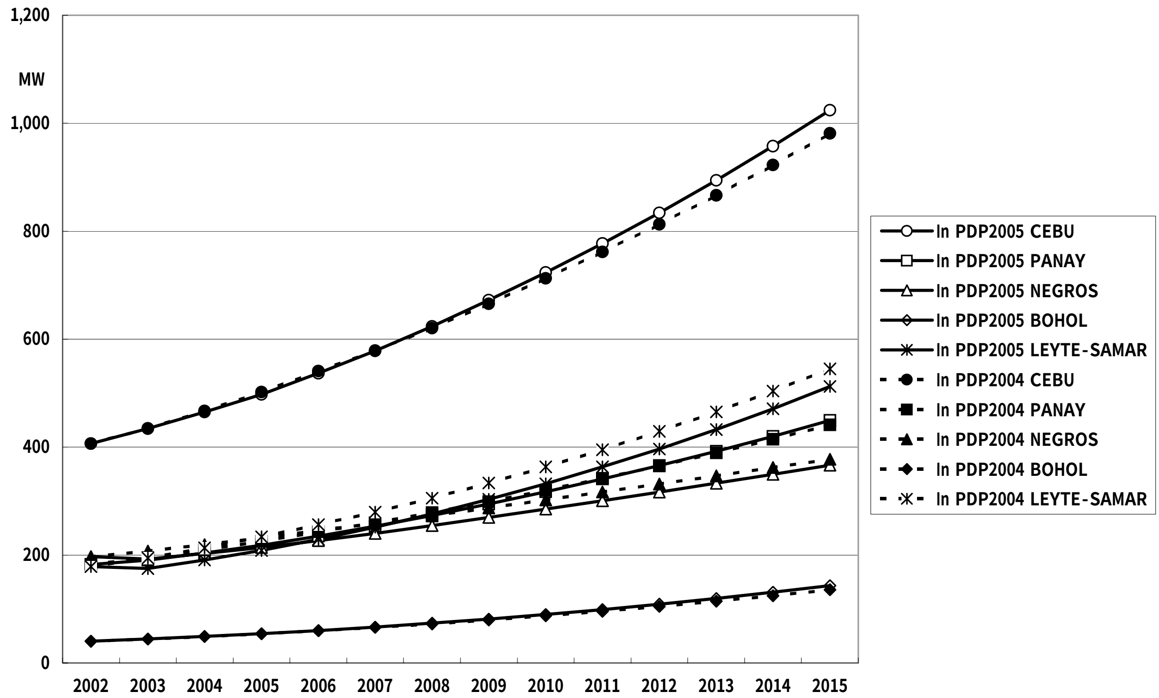
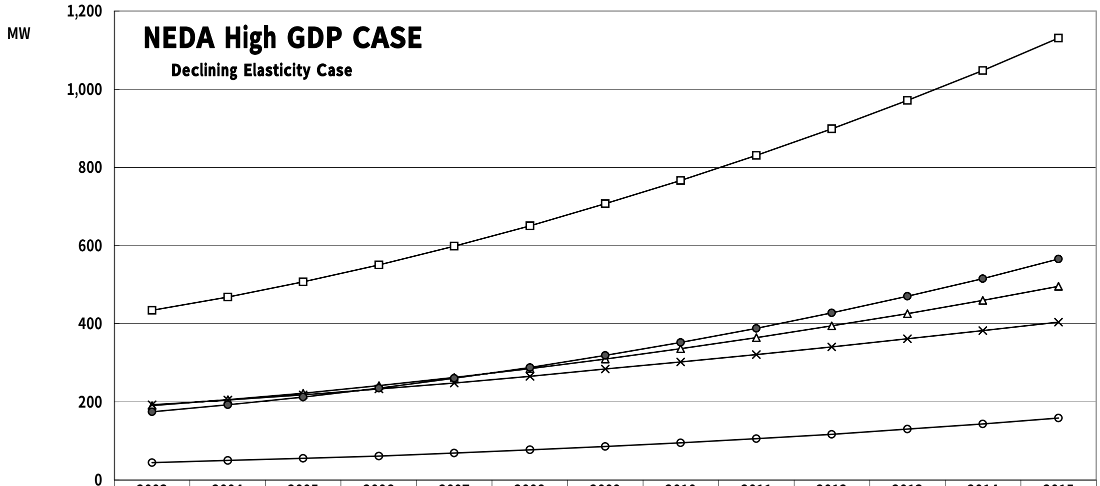
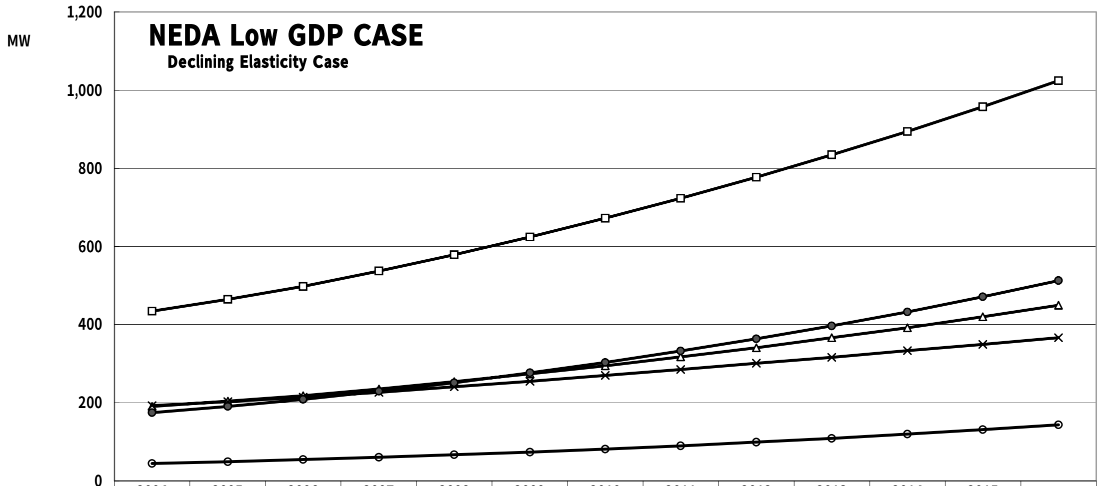


Figure 3.9 Comparison demand forecast result for Visayas Island with previous study



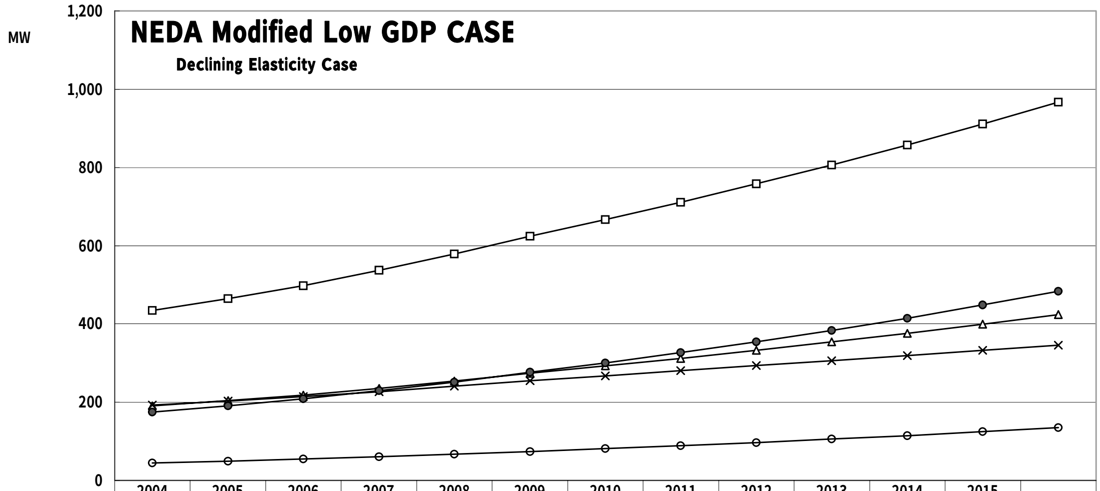
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CEBU	434.4	468.7	506.6	550.9	598.6	650.7	707.1	767.1	830.9	898.8	971.2	1,048.4	1,130.9
PANAY	190.4	205.4	222.0	241.5	262.4	285.3	310.0	336.4	364.4	394.2	426.0	459.9	496.1
NEGROS	192.7	204.7	217.7	232.8	248.8	265.8	283.8	302.3	321.5	341.2	361.7	382.8	404.6
BOHOL	44.8	49.7	55.3	61.8	69.0	77.0	85.8	95.4	105.9	117.4	129.9	143.5	158.3
LEYTE-SAMAR	175.1	192.6	212.2	235.2	260.4	288.2	318.9	352.2	388.3	427.3	469.7	515.7	565.6

Figure 3.10 Results for Visayas islands (NEDA High GDP –Decline Elasticity)



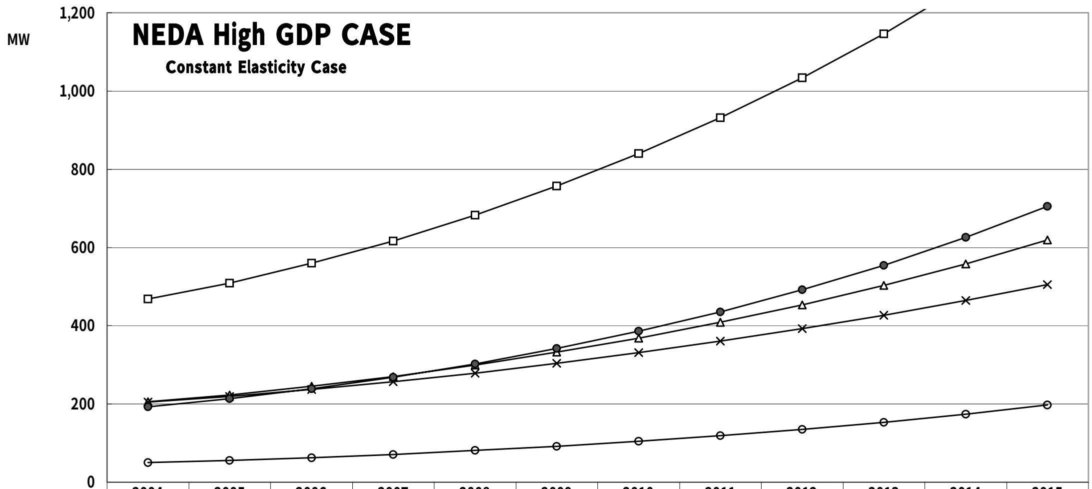
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
CEBU	434.4	464.8	497.9	536.8	578.5	623.7	672.3	723.5	777.4	834.2	894.2	957.5	1,024.4
PANAY	190.4	203.7	218.2	235.3	253.6	273.4	294.8	317.2	340.9	365.9	392.2	420.0	449.4
NEGROS	192.7	203.0	213.9	226.9	240.4	254.7	269.8	285.1	300.7	316.7	333.0	349.6	366.5
BOHOL	44.8	49.3	54.3	60.2	66.6	73.8	81.6	90.0	99.1	109.0	119.6	131.0	143.4
LEYTE-SAMAR	175.1	191.0	208.6	229.2	251.6	276.3	303.2	332.2	363.2	396.6	432.5	471.0	512.4

Figure 3.11 Results for Visayas islands (NEDA Low GDP –Decline Elasticity)



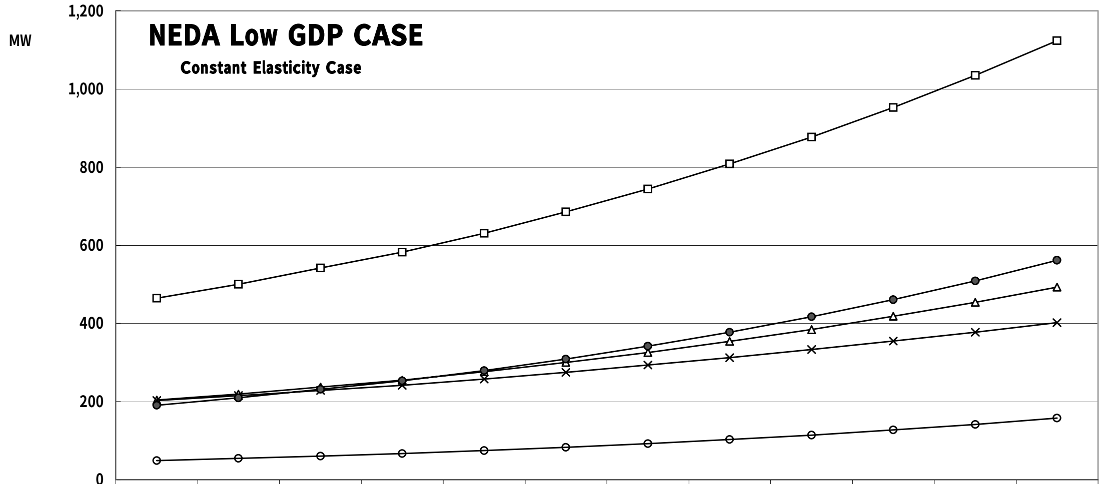
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
CEBU	434.4	464.8	497.9	536.8	578.5	623.7	666.6	711.3	758.0	806.8	857.7	911.0	966.8
PANAY	190.4	203.7	218.2	235.3	253.6	273.4	292.3	311.9	332.4	353.8	376.2	399.6	424.1
NEGROS	192.7	203.0	213.9	226.9	240.4	254.7	267.5	280.3	293.3	306.3	319.4	332.6	345.9
BOHOL	44.8	49.3	54.3	60.2	66.6	73.8	80.9	88.5	96.6	105.4	114.7	124.7	135.4
LEYTE-SAMAR	175.1	191.0	208.6	229.2	251.6	276.3	300.6	326.6	354.2	383.6	414.8	448.1	483.6

Figure 3.12 Results for Visayas islands (NEDA Modified Low GDP –Decline Elasticity)



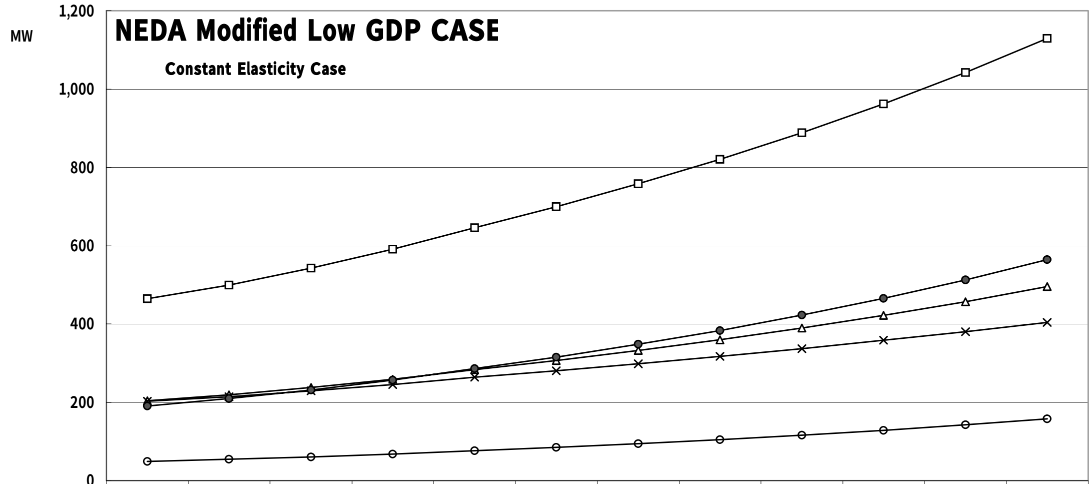
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CEBU	468.7	508.9	559.6	616.9	682.7	757.3	840.0	931.8	1,033.6	1,146.6	1,271.8	1,410.8
PANAY	205.4	223.1	245.3	270.5	299.3	332.0	368.3	408.6	453.3	502.9	557.9	618.9
NEGROS	204.7	218.7	236.5	256.4	278.8	303.9	331.0	360.5	392.4	427.0	464.3	504.7
BOHOL	49.7	55.5	62.8	71.1	80.7	91.9	104.5	118.8	135.0	153.3	174.1	197.5
LEYTE-SAMAR	192.6	213.2	238.9	268.3	302.4	341.6	385.7	435.4	491.4	554.6	625.6	705.7

Figure 3.13 Results for Visayas islands (NEDA High GDP –Constant Elasticity)



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CEBU	464.8	500.0	541.5	582.5	630.9	685.1	743.9	807.8	877.2	952.5	1,034.3	1,123.1
PANAY	203.7	219.1	237.4	255.4	276.6	300.4	326.2	354.2	384.7	417.8	453.7	492.7
NEGROS	203.0	214.8	228.8	242.1	257.7	274.9	293.2	312.5	333.0	354.7	377.6	401.8
BOHOL	49.3	54.6	60.7	67.1	74.6	83.1	92.5	103.0	114.6	127.4	141.6	157.3
LEYTE-SAMAR	191.0	209.5	231.2	253.4	279.4	309.0	341.6	377.5	417.1	460.7	508.8	561.8

Figure 3.14 Results for Visayas islands (NEDA Low GDP –Constant Elasticity)



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CEBU	464.8	499.4	542.7	591.1	646.1	699.7	757.8	820.7	888.8	962.5	1,042.4	1,129.0
PANAY	203.7	218.9	237.9	259.1	283.3	306.8	332.3	359.9	389.8	422.2	457.3	495.3
NEGROS	203.0	214.6	229.4	245.6	263.9	280.8	298.6	317.5	337.4	358.4	380.6	403.9
BOHOL	49.3	54.5	60.9	68.1	76.4	84.9	94.3	104.6	116.1	128.7	142.7	158.1
LEYTE-SAMAR	191.0	209.2	231.7	257.1	286.2	315.6	347.9	383.5	422.6	465.5	512.8	564.7

Figure 3.15 Results for Visayas islands (NEDA Modified Low GDP –Constant Elasticity)

3.2 Demand Forecasting by Aggregating the DU Demand (based on the DDP)

3.2.1 Methodology for Aggregation of DU Demand

The DOE established the DDP data collection scheme which facilitated the collection of individual DUs' demand data, both historical and forecast demands. Aggregating the individual DUs' demand forecasts by major island groupings, the DOE was able to estimate the total regional demand forecasts. This is a bottom-up planning approach and this is the first time DOE adopted this methodology. Likewise, this was also the first time for DOE, NEA_and the DUs to collaborate in preparing the plans, PDP and DDP

The step-by-step process employed is described below:

1. Sum up all of DUs' and large consumers' demand forecast , in kW, for the target area.
   All demand forecast, in kW, are measured through the TRANSCO operators.
   The target areas are classified as follows:

- Luzon area
- Visayas area
  - ✓ Leyte-Samar
  - ✓ Cebu
  - ✓ Negros
  - ✓ Panay
  - ✓ Bohol
- Mindanao area

2. The aggregated demand for all the DUs and large customer is calculated by step1.
   However, this value does not include the element of the system loss (e.g. energy consumption for auxiliary for S/S operation and transmission loss) and the asynchronism of the peak demand occurrence. Therefore, the aggregated demand in Luzon, Mindanao and five region of Visayas have to be compensated for by use of the generated power measured by TRANSCO.

   The correction factor to compensate the aggregated demand was calculated by using the peak demand measured in 2003 by TRANSCO as below:

$$Correction\ factor = \sum \frac{(Power\ generatation\ in\ the\ power\ plants)}{(Peak\ demand\ in\ DUs\ and\ L\arg e\ customers)} \quad (3\cdot1)$$

*All data were measured through TRANSCO system operator, in 2003

3. A regional demand forecast was calculated by using the above correction factor, as shown below:

$$Forecasted\ peak\ demand = Correction\ factor \times Forecasted\ peak\ demand\ by\ DDP\ aggregation \quad (3\cdot2)$$

This value is call "demand forecast value by DDP aggregation". This calculation will be done in each target area every year.

4. In Visayas area, it was assumed that demand peak in each island occurred at a time. Therefore, the value of the correction factor in the Visayas calculated to 0.981, close to 1 because the the asynchronism among only the five islands is taken into consideration.

$$Correction\ factor = \sum \frac{(Power\ generatation\ in\ the\ power\ plants)}{(Peak\ demand\ in\ each\ island)} \quad (3\cdot3)$$

Visayas area demand forecast was calculated by using this correction factor as shown below:

This value is call "demand forecast value by DDP aggregation".
The DOE strongly requested DUs to submit DDP. However, the submission rate is only 79% for DUs connected to the main grid and 74% submission rate for whole Philippines. Also, the DOE tried to improve the accuracy of the demand forecast by doing the following:

- Required the DUs that did not submit DDP to submit the forecasted and recorded value of the peak demand at least.
- Check the relation between monthly actual peak demand by TRANSCO and the peak demand in DDP.

3.2.2 Deviation between Aggregated and Macro Approach Demand Forecasts

Figure 3.16 shown below is a comparison between Macro approach results (NEDA Low declining elasticity) mentioned in Section 3.1 and Aggregated demand forecasts by DUs. Typically the result of aggregated DU demand forecast is relatively lower than the result of the Macro approach. In year 2014, aggregated forecast demand is almost 20% lower than demand derived by Macro approach.

Looking at difference of growth rate of each approach (Figure 3.17), generally growth rates forecasted by DUs are 1 – 2% lower than growth rates estimated using the Macro approach, except in Mindanao in 2004 – 2005.. The variance in the growth rate using the two methodologies is estimated to reached 20% by year 2014. If NEDA's Low GDP scenario will be used as GDP growth assumption, the variance in growth rates means that forecast demand by DDP aggregation assess the value of elasticity lower than trend. In other word, each DU estimated lower growth rate based on lower economic growth than NEDA.

The following Figures 3.18 - 3.23 show the historical 5 years average elasticity and evaluated elasticity by forecasted demand against NEDA's low GDP growth scenario both in the case of Macro approach with NEDA's low GDP scenario and declined elasticity assumption, in the case of forecasted demand by DDP aggregation.

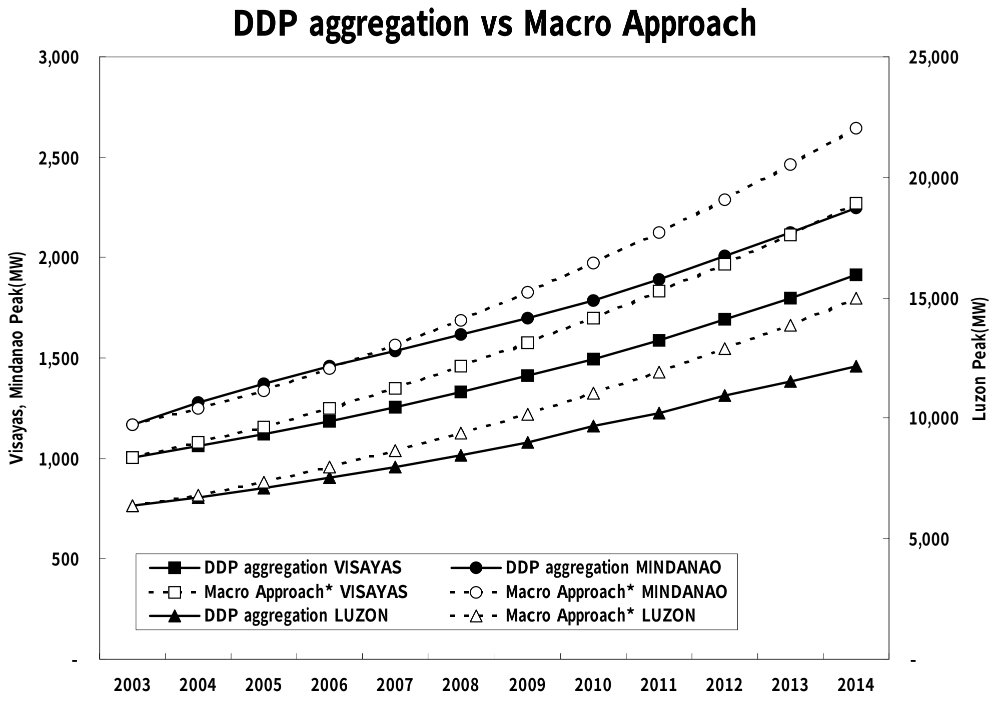


Figure 3.16 Comparison between Macro results (NEDA Low declining elasticity) and DDP Aggregation

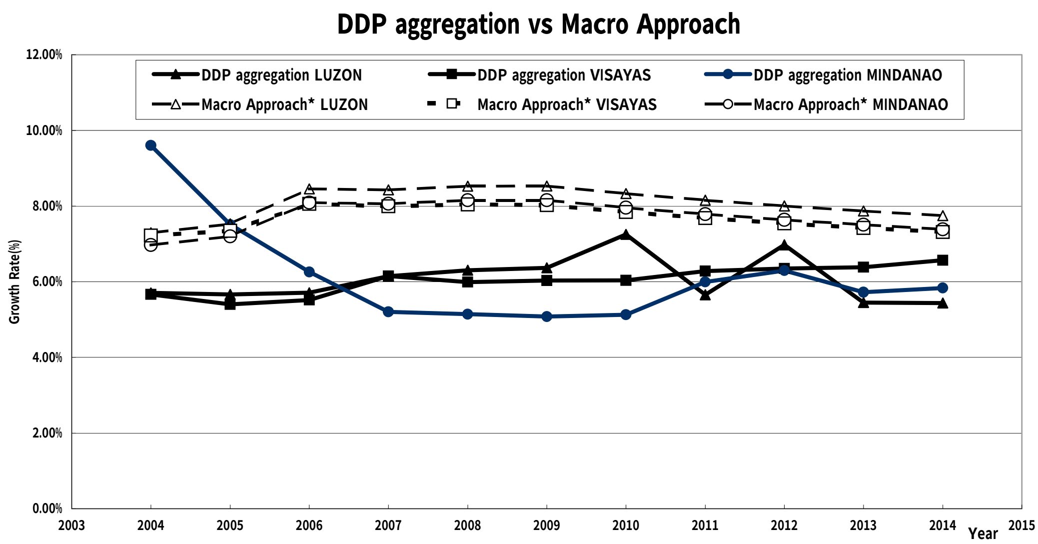


Figure 3.17 Comparison of growth rate between Macro results (NEDA Low declining elasticity) and DDP Aggregation

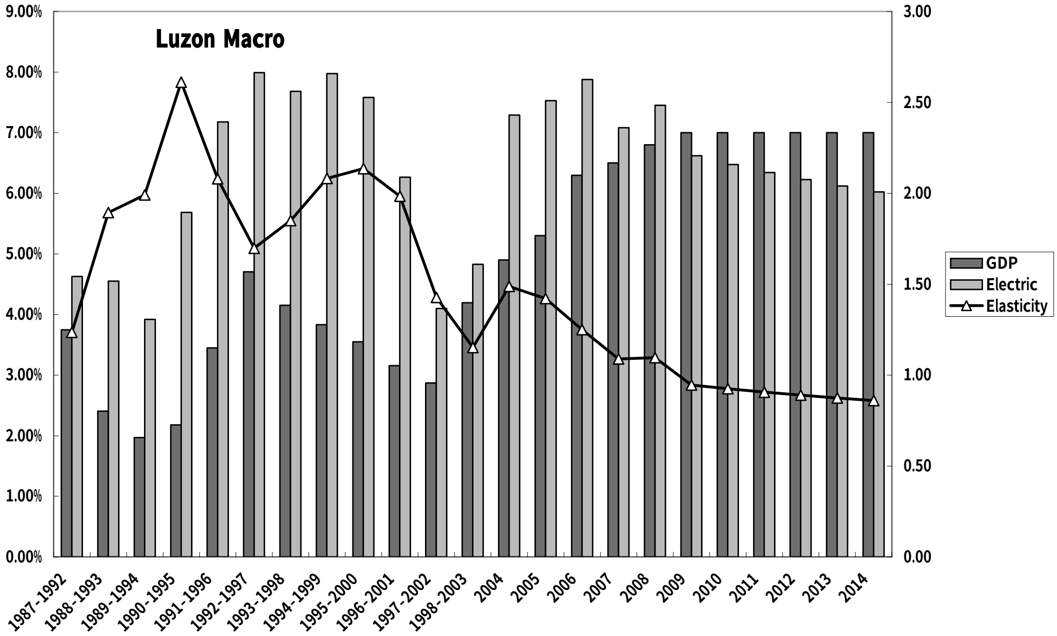


Figure 3.18 Historical (5 years moving average) and Forecasted Elasticity and GDP, Electric demand growth rate in the case of Macro approach (NEDA Low GDP scenario declined elasticity)

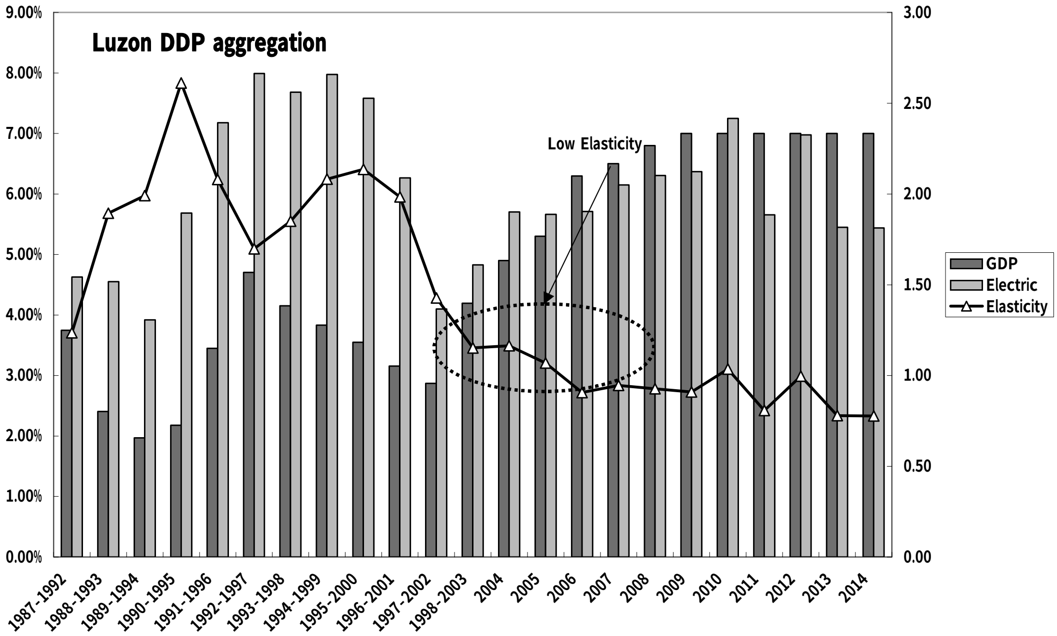


Figure 3.19 Historical (5 years moving average) and Forecasted Elasticity and GDP, Electric demand growth rate in the case of DDP against aggregated with NEDA Low GDP scenario

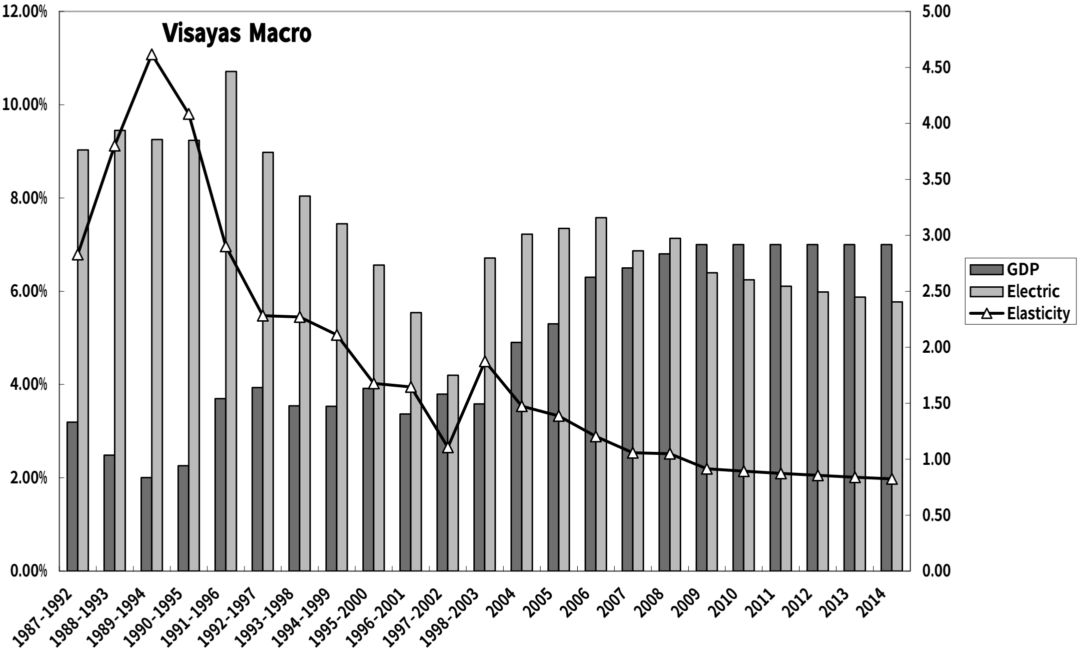


Figure 3.20 Historical (5 years moving average) and Forecasted Elasticity and GDP, Electric demand growth rate in the case of Macro approach (NEDA Low GDP scenario declined elasticity)

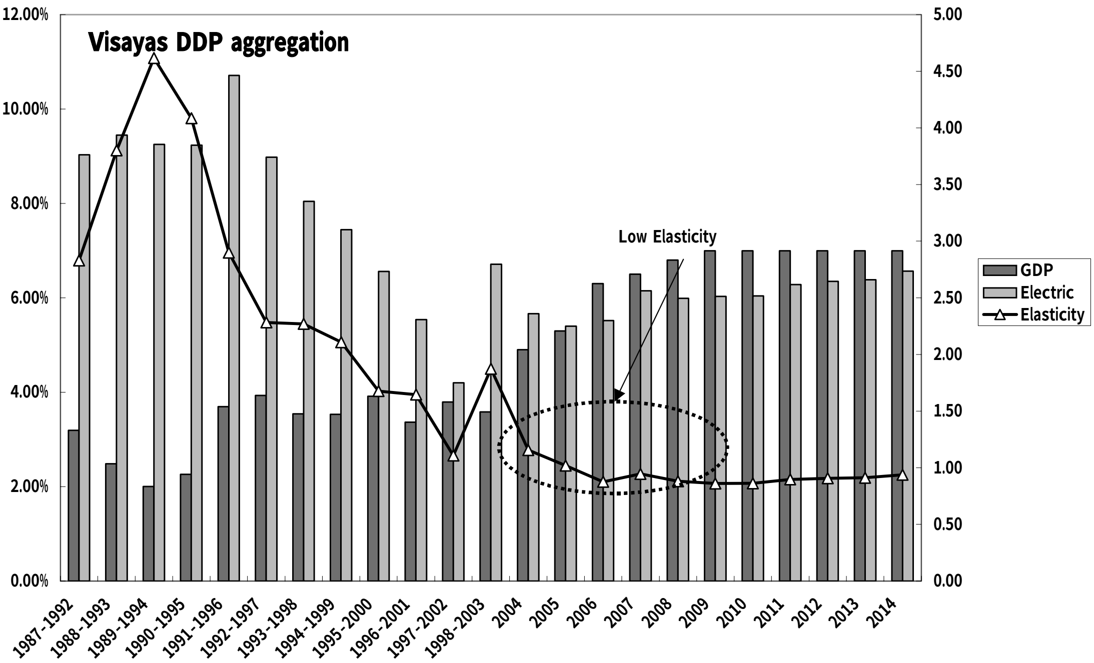


Figure 3.21 Historical (5 years moving average) and Forecasted Elasticity and GDP, Electric demand growth rate in the case of DDP against aggregated with NEDA Low GDP scenario

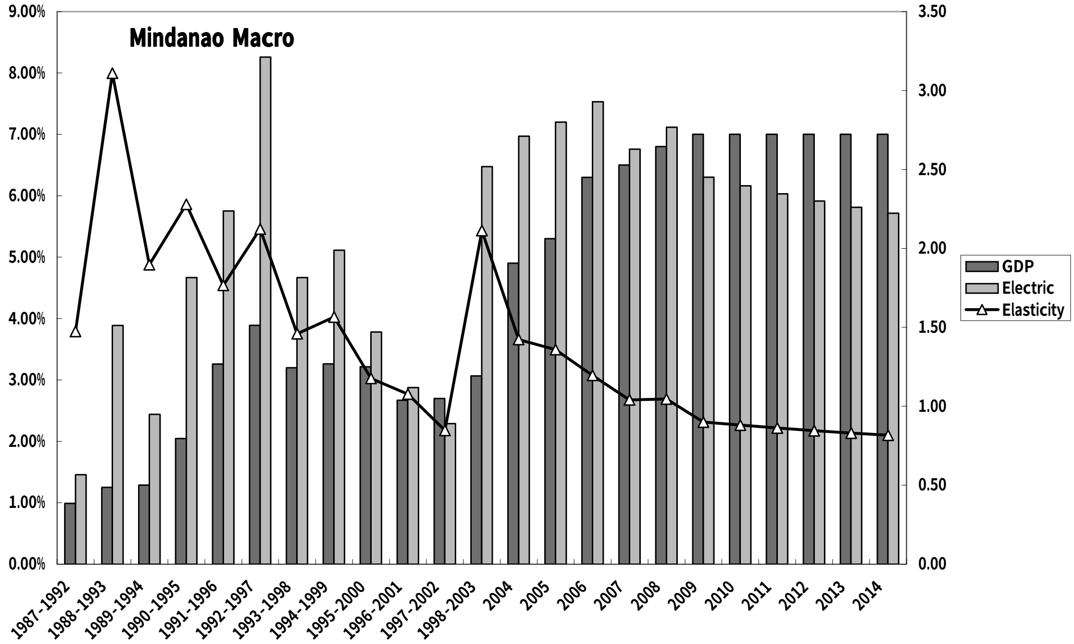


Figure 3.22 Historical (5 years moving average) and Forecasted Elasticity and GDP, Electric demand growth rate in the case of Macro approach (NEDA Low GDP scenario declined elasticity)

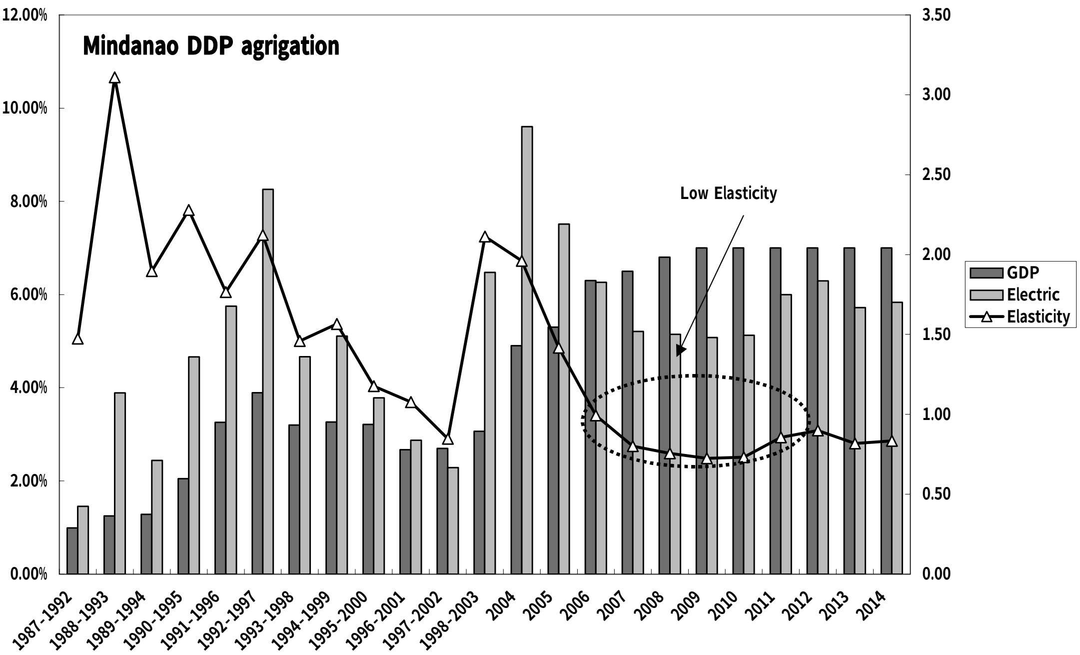


Figure 3.23 Historical (5 years moving average) and Forecasted Elasticity and GDP, Electric demand growth rate in the case of DDP against aggregated with NEDA Low GDP scenario

About demand forecasting of each island in Visayas, DDP aggregated demand forecasting result and the result of Macro approach can also be compared with each other. If DDP aggregation is determinate area such as region or island, each DDP aggregated demand forecast result by region or island shows different characteristics. For example, in Visayas, in Cebu and Bohol island Macro approach derives higher forecasting result than DDP aggregation. However, in Panay, DUs forecast very optimistic demand growth, as average demand growth rate is almost 8 – 9%. So, DDP aggregated demand forecasting result becomes 20% higher than the result of Macro approach.

This means that the DOE should be careful about varying assumptions of each utility in forecasting demand in the distribution system.

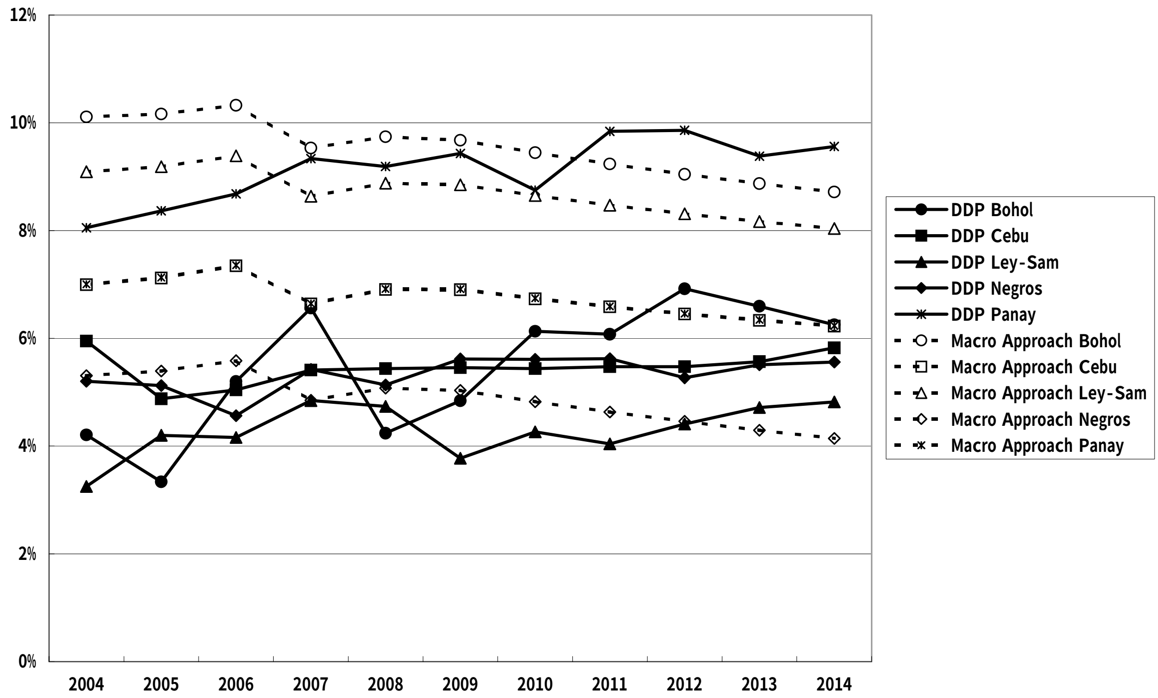


Figure.3.24 Macro(NEDA Low declining elasticity) vs. DDP in Visayas

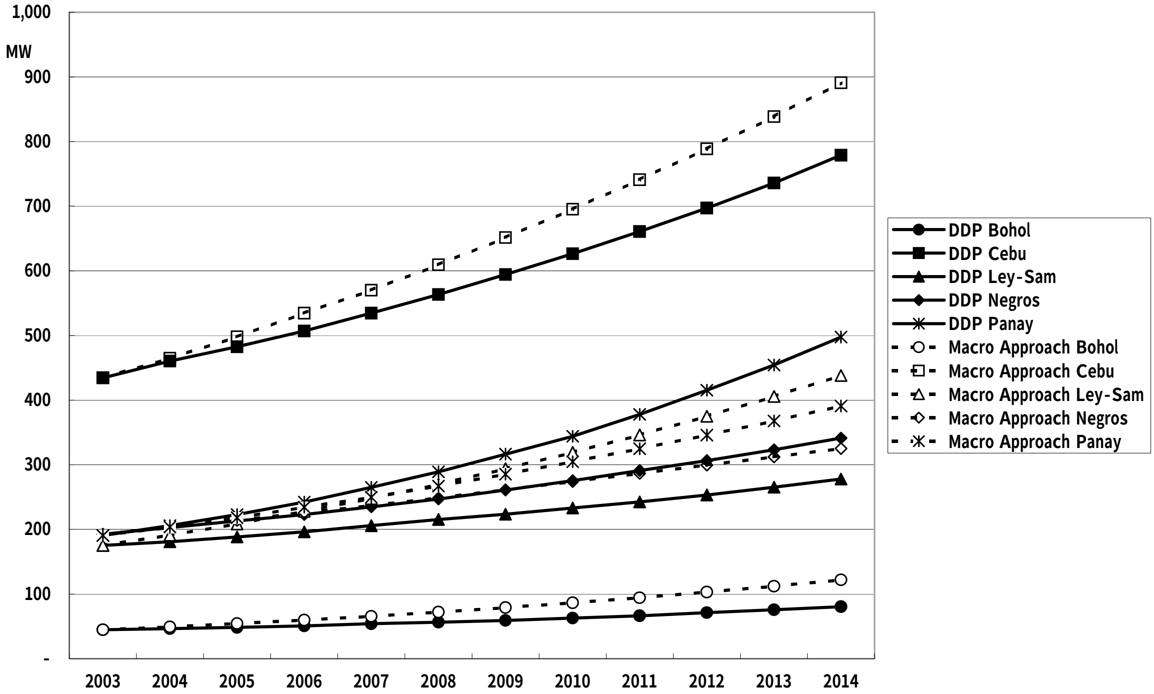


Figure 3.25. Forecasted growth rate in Visayas

3.3 Recommendation for Future Development of Survey

3.3.1 Multi – Purpose Demand Forecasting Approaches

In electric power system, there are several time horizon for planning. These are the following:

(i) Long term (10 –20 years)

Usually, long term power system planning is applied for the purposes such as evaluation of impact of utilities' investment on future rate, energy usage in power sector or impact of electric power sectors consumption on environmental.

This concept is very important for utility's cooperative planning or political and governmental issues. For this purpose, integrated resource planning tools such as WASP, PROSCREEN by Newenergy Associates-Siemens or U-PLAN by EPRI are applied. These tools can evaluate and optimize investment of resources.

(ii) Middle term (seasonally – 5 years)

Usually, middle term planning is applied for the purpose such as transmission planning and reliability study, coordination of maintenance schedule or evaluation of impact of utilities' operation on future rate.

This concept is very important for system operator or transmission, distribution or generation plant owners. For this purpose, production cost analysis tools such as PROSYM by Henwood or

PROMOD by Newenergy Associates-Siemens are applied. These tools can evaluate total production cost and avoided cost. Sometimes the production cost tools are updated as middle term market analysis tools.

(iii) Short term (Day ahead – weekly ahead)

Usually, short term planning is applied to weekly ahead or daily ahead operation of power system or generation. This concept is very important for system operator or players in electric market. For this purpose, several market simulation tools are applied.

Accordingly, the varying time horizon of planning for demand forecasting presents the following concepts:

(i) Long term. Usually, demand curve is treated as annual duration curve due to capability to present multi-year generation mix. Therefore, forecasting method estimates peak demand and total consumption (or generated) energy, and then estimate annual duration curve directly.

(ii) Middle term. Usually, a weekly demand curve is applied. The steps in developing weekly demand curve are as follows:.

- Set weekly load profile curve by month or season
- Estimate monthly or weekly peak and energy from other approach
- Multiplying load profile and peak demand to create first weekly demand curve
- Adjust demand curve to fit weekly energy consumption

(iii) Short term. Daily or weekly curve is estimated by some tools directly. These tools are based on regression method, Time Series Analysis such as ARIMA model or Neuron computing. Usually, these tools may be developed in-house. However there are some package tools available such as NOSTRADAMUS by Newenergy Associates-Siemens.

3.3.2 Development and Application of Demand Side Management (DSM) Tools

Demand Side Management (DSM) became popular in early 90's in developed countries such as the USA. The rationale for application of DSM principles are for energy conservation and reliability. "Load Management" concept was introduced in the electric power industry. The "Load Management" tool is used for direct and/or indirect control of demand especially for peak shaving. For example, in the USA, a technology directly cutting off the demand by using signal carrier of FM broadcast has been developed and utilized by several utilities. Time of use (TOU) rate is one of the ways of indirect control method.

In the '90s, the green house effect became an environmental concern leading to political debates and concrete actions. As a consequence, energy conservation was integrated into the DSM system. Some examples of new technologies include efficient lighting, more efficient air conditioner, well insulated water heater or well insulated and ventilated house structural designs. To promote these technologies, several incentive packages to customer and utilities were developed and adopted through the 90's.

However, some DSM programs did not succeed and electric power industry deregulation then is just in its early stage of implementation even in developed countries. These led to the decline of DSM applications. With the above experiences, the following insights can be considered:

(i) Evaluation of DSM effect on load profile.

The effects of DSM program are generally evaluated based on medium to long term planning scenarios, specifically its application in the production management. The impact of DSM is evident in the resulting.total demand profile (shape) of a power plant. Particularly, the impact DSM programs, softwares or tools are evaluated from the load profile/shape due to the difficulty of modeling using full end-use load shape aggregate. Moreover, the common practice of evaluating the impact of DSM is through comparison of the demand profile before and after application of DSM.

(ii) Methods of Estimating Impact of DSM

To estimate effect of DSM on load shape, end-use load profile is measured. For example, if we would like to know the effect of changing from electric bulb to fluorescent, measurement of load shape of lighting before and after implementation is needed. Usually over 100 samples are enough to estimate typical (average) load shape of DSM effect per customer. Total effect of DSM is calculated by multiplying the number of participants and typical (average) effect on load shape per ocustomer.

(iii) Lifecycle of DSM

Typical DSM programs have short life cycle comparison with supply side options such as construction of new plant or transmission line, because life cycle of end use facilities and equipments in customer side are usually shorter than the supply side facilities. Therefore, it is very important to apply present value evaluation in the production cost evaluation.

(iv) Incentives for DSM

To promote the DSM programs, utilities must provide incentives to participants because efficient facilities, equipments and gadgets are understandably more expensive than ordinary counterpart models. However, if the incentives will entail more cost than investment and operation cost of supply side facilities, then the DSM option becomes an irrational alternative.

In the 90s, US utilities found that DSM programs for air-conditioning systems are less effective due to difficulty in achieving the required load reduction by introducing high efficiency air-conditioners. In many cases, introducing high efficiency air-conditioner means introducing very powerful air-conditioner to customers.

From the viewpoint of utilities, energy conservation type of DSM results to reduction in revenue. Therefore, there is no incentive for the utilities to promote DSM. In California, the state government did not allow recovering lost profit as a result of DSM implementation. The situation created friction between the utilities and the California government or the regulatory body; the case amplified and was said to be contributory to the California power crisis. The foregone profit as a result of DSM implementation can be recovered from customers, and the mechanism works in the same manner as the universal charge in rate regulation. In the case of deregulated market, this kind of control does not work well. The cost recovery scheme should be charged as tax on the payment of electricity bill.

(v) Time of Use (TOU) Rate-Setting for DSM

TOU rate-setting methodology for DSM is well – accepted for improving load factor. Most utilities in the world use TOU rate. To design the appropriate TOU rate, measurement of hourly price elasticity is very important.

In late 80s, Electric Power Research Institute (EPRI) in the USA promoted several TOU project to measure price elasticity in the state of Wisconsin. In the studies, several behaviors of price elasticity were tested to explain price elasticity on the customer side. If there are 3 coefficients on assumed price elasticity formula, 4 different TOU rates must be prepared to determine the coefficients at least. Unfortunately, the experiments just confused the customer. On the other hand, the demand forecasting software called "REEPS" developed by EPRI adopted a very simple linear function with 0 intercept for the elasticity. In this case, the comparison of load shapes between participants and non-participants is enough for determining the coefficient of the linear function.

3.3.3 Price Elasticity in Demand Forecasting and Market Operation

Recently, several market operators and regulators introduced the concept of price elasticity in power market to maintain reliability in market operation after California crisis. Looking at the report "Demand-Response Research Plan to Reflect the Needs of the California Independent System Operator (CAISO)" prepared for California Energy Commission Public Interest Energy Research Program by Consortium for Electric Reliability Technology Solutions (February 2004), there are two types of load. The report discussed the two basic categories of demand response, these are elastic load and dispatched load. Elastic load responds continuously to the price of electricity through market mechanisms. It provides an inherent level of market response. If the price signals presented to the load reflect the locational and temporal constraints on the bulk power system, then elastic load can increase system reliability and decrease system costs." Also the report cited that demand elasticity exists when some customers elect to reduce consumption of a particular commodity during periods of high price; this is a case of elastic demand.

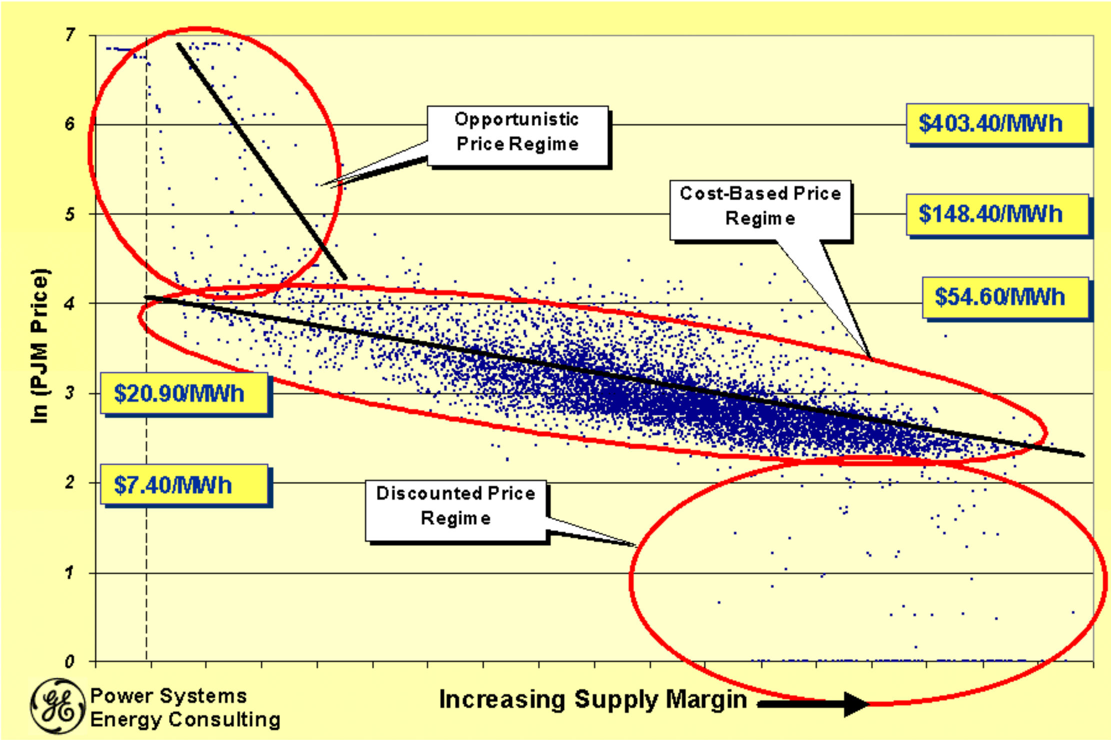


Figure 3.26 Relationship settlement price and demand in PJM (analyzed by GE)

The power market demonstrates less price elasticity, so electricity prices tend to be volatile. The figure shown above presents the historical data on relationship of settlement price and demand in PJM in the end of 90s. In the figure, supply margin becomes less as electricity price increases rapidly. This phenomenon can be explained as follow: Peaking unit with low capacity factor becomes marginal in the situation of less supply margin. Such generation must recover investment cost in very short period, so those generator bid very high price. On the other hand, demand has less price elasticity, so volatility of electricity price is reflected by those high marginal cost generation.

fter the experience of price spike during the California crisis, system operators are trying to introduce more price elasticity in the market. If utilities buying energy from wholesale market sells its energy with flat rate in retail market, it is difficult to expect price elasticity in the retail customers. Thus, the system operator or the government recommends demand side bidding in the market. Long-term contracts for large customer buying electricity from wholesale market, or ability to get electricity from its own generator might be an action that increases price elasticity. Such efforts bring price elasticity into the market and mitigate volatility of electricity prices. In the Philippines, large customers oftentimes have their own generator due to low reliability of power system.

Usually, price elasticity is a negative number because demand is reduced when price goes up. Consequently, high elasticity means large absolute value of elasticity as presented in the report.

On the measurement of price elasticity, many literatures suggested the use of rigorous econometric analysis.

In the long term planning, price elasticity should be considered as the relationship between primary energy price and economy index such as the GDP because future electric price is strongly affected by future primary energy price. Moreover, future GDP is influenced by future primary energy price. Therefore, primary energy price forecast is important and its influence must be reflected in the economic model, which is used for deriving future GDP growth rate.

Recommendations for Demand Forecasting

Below are the following recommendations proposed from a demand forecasting viewpoint:

(i) Data collection when WESM starts.

All wholesale electricity trading, regardless of the mode of transaction, will be coursed through the WESM. Thus the data requirement for the preparation of the PDP can be obtained from the WESM. However, in Mindanao where the market implementation may come much later, the data will be collected from the Mindanao System Operations (SO).

The necessary data to be collected from WESM are the following;

1. Total energy transmitted through the transmission system
2. Annual peak demand recorded by the System Operations
3. Total transmission losses
4. Sales to directly-connected customers

These data will be used to update the AF and LF in the econometrics approach in demand forecasting

(ii) Requirements for Demand Forecasting using Aggregated DU Demand (DDP)

For this year, the DOE aggregated DUs forecast peak demand (measured in kW). Another approach may be considered and this is the aggregation of sales energy (measured in MWh). The process is as follows:

- Evaluation of purchased and generated energy of each DUs including embedded generation;
- Aggregation of forecasted energy generation and purchase of DUs in target area;
- Translation of aggregated energy generation and purchase to system peak demand through AF and LF used in Macro approach;
- Adjust start point of demand growth using same method as Macro.

Using this process, loss in transmission and distribution system are considered automatically based on previous years historical data. In this process, updated AF and LF derived by method mentioned in step

(iii) Load survey for study of DSM

In consideration of the application of DSM for the Philippines' electric power industry, load information are very important. Application of DSM programs may be considered for medium-term planning and it is important the both pre- and post DSM information on relevant parameters in the production model are measured and recorded. For evaluating new DSM programs, following processes are needed.

- Total Load profile data: These data can be collected from the system operator already. Also, they can be collected through the WESM in the future.
- Difference of target end use load shape before and after introducing DSM: These data should be collected through end use load survey. Usually, about 50 – 100 sample data will be required to determine typical load shapes of end use. If the DOE wants to promote DSM such as energy conservation, the DOE must undertake load surveys.
- Number of Participants (End Use): To estimate total effect of DSM from difference of target end use load shape before and after introducing DSM, estimation of participants is required. It is important to estimate potential participants and to establish market penetration model of DSM program. These kinds of studies were done in the early of 90s in the developed countries, especially in the USA.
- Evaluation on the production model: Effects of DSM are usually evaluated considering the production model using chronological load shape. Using this process, marginal cost of DSM can be evaluated. If impact of DSM on generation planning under a long term planning scenario (using WASP), its impact should be reflected to future DEMAND scenario as reducing peak and energy demand. This may result in the deferment of installation of new capacity and should be calculated on the resource planning tools.

(iv) Study of price elasticity in the market

Creating price elasticity in the power market is still a big issue in the established market. Therefore, long term effort will be required to develop the know-how of market analysis and controlling elasticity.

It is not easy to expect price elasticity from customers who are supplied electricity with flat rate. On the other hand, customers who are buyers directly connected to the transmission system. may demonstrate price elasticity. In the Philippines, most of the large customer might have their own generation facilities due to power reliability requirements and potentially these customers will exhibit price elasticity than customers in developed countries.

It might be possible to estimate price elasticity in the market through survey of self –generators. In the survey, if marginal price of self-generation and opinion about access to open market are investigated, it might be helpful to estimate price elasticity in the new open market in Philippines.

From the viewpoint of anticipatory market, inclusion of demand side to the bid is also important to improve price elasticity and to reduce volatility of settlement price. This is also important issue to study in future.

4. Power Development Program

As described at the beginnings of this report, the simulation for the PDP(2005-2014) was implemented mainly by the DOE. Therefore the figures shown in this chapter may differ from the published PDP, because these figures are the results of the trial calculation conducted by the DOE and JICA study team in early September 2004.

4.1 Status of Existing Power Generation Units

Table 4.1 Existing Power Units (Year 2003)

(Unit:MW)

Type \ Region	Luzon		Visayas		Mindanao		Total		
	Installed	Dependable	Installed	Dependable	Installed	Dependable	Installed	Dependable	(%)
Coal	3,769	3,551	189	140	0	0	3,958	3,691	(28%)
Diesel	964	866	475	366	559	524	1,999	1,755	(13%)
Natural Gas	2,763	2,703	0	0	0	0	2,763	2,703	(20%)
Gas Turbine	900	720	55	50	0	0	955	770	(6%)
Geothermal	907	604	916	856	108	108	1,932	1,568	(12%)
Hydro	1,858	1,428	12	12	998	828	2,867	2,267	(17%)
Oil Thermal	650	650	0	0	0	0	650	650	(5%)
Total	11,812	10,521	1,647	1,424	1,665	1,460	15,124	13,404	(100%)

Source：DOE

The above Table 4.1 shows the dependable capacity versus the installed capacity[1]. The total dependable capacity of 13,404MW is 88.6% (＝13,404÷15,124×100%) of the installed capacity of 15,124MW. The following equation is the effective ratio (dependable capacity / Installed capacity) of thermal power plants.

Effective ratio of thermal power plant = （13,404－2,267） ÷ （15,124－2,867） ×100%

Dependable Non-Hydro ÷ Installed Non-Hydro

＝ 90.9%

The above equation means the effective capacity of thermal power plant is only 90.9% of installed capacity, i.e. about 10% of capacity is unreliable.

This deterioration is caused by: ① the aging of geothermal power plants, ②the deteriorate of coal-fired power plant such as that in Calaca and Sual. The former reason will be solved in 2005 by the scheduled rehabilitation of aging geothermal plants such as Tiwi and Makban. The latter is caused by the low heating value coal fuel, etc. As these will have an impact on the asset bidding by PSALM, the reason should be further investigated and disclosed to parties interested with the asset bidding.

[1] The capacity calculated by WASP-IV accounts for Installed capacity of Hydro + Dependable capacity of Thermal

4.2 Committed Projects, Retirements

4.2.1 Committed Projects

Table 4.2 shows the committed projects.

Table 4.2 Committed Projects

	Project name	Capacity MW	Commissionig year	Location
Luzon	Northwind Power	25	Feb-05	Ilocos Norte
Visayas	Pinamucan transfer from Luzon	110	Jun-05	Panay
Luzon	PNOC-EDC Wind Power	40	Aug-06	Ilocos Norte
Visayas	Northern Negros Geo	40	Dec-07	Negros
Visayas	PNOC-Palinpinon Geo	20	Dec-07	negros
Visayas	Talisay Bioenergy	30	2007	Negros
Visayas	Victrias Bioenergy	50	2008	Panay
Mindanao	Transfer PB101,103&104	75	2005	South Mindanao
Mindanao	Mindanao Coal	210	Jan-07	Misamis Or.
Total		600		

Source: DOE

The committed projects in Luzon are limited to windmill projects, because prospective investors are still awaiting for the results of asset bidding by the PSALM

In the Visayas, there is a looming power crisis in the near future. As one remedy, some units of Pinamucan D/D is planned to be transferred to Panay island. Other plants are programmed to be constructed in Negros island. However, since local residents strongly resist the fissile fueled thermal power plant construction, only renewable energy power plants are likely to be constructed in Negros. And because of limited committed projects in the Visayas, the power crisis will persist in the area for years.

A power plant in Northern Mindanao is planned to be operational by 2007. However, (1) The load center of Mindanao is in South Mindanao, and 2) The Transmission capability from north to south of the island is not enough to send necessary power.. Considering the above, power development in South Mindanao and /or reinforcement of transmission line in Mindanao should be prioritized.

4.2.2 Indicative Projects

Indicative projects are power generation projects that can be developed potentially in the future. Indicative projects are more realistic than the necessary lineup. Although ndicative projects are not yet counted in the PDP, it is very important to carefully examine the possible and available projects vis-a-vis the necessary capacity addition.

Table 4.3 Indicative Projects

	Project name	Capacity MW	Commissionig year	Location
Luzon	Sucat Conversion	450-850	2007	M.Manila
Luzon	Limay Conversion	250	2007	Bataan
Luzon	Limay Conversion	250	2008	Bataan
Luzon	Greenfield Natural Gas Plant	600	2008	Bataan
Luzon	Greenfield Natural Gas Plant	600	2009	Bataan
Luzon	Tarlac Bioenergy	40	2008	Sn. Miguel, Tarlac
Luzon	Pagbilao Coal III	350	Dec.2008	Quezon
Luzon	Tanawon Proj.(Bacman Opt.)	40	2009	Sorsogon
Luzon	North Luzon Phase 2 Wind Proj.	40	2009	Ilocos Norte
Luzon	Malaya Conversion	600	2010	M.Manila
Luzon	Manito-Kayabong Geo Project	40	2011	Manito, Albay
Luzon	Greenfield Plant	900	2011	Northern Luzon
Luzon	Greenfield Plant	600	2012	Northern Luzon
Luzon	Greenfield Plant	900	2013	Northern Luzon
Visayas	San Carlos Wind Farm	30	Jul-06	Negros
Visayas	KEPCO Clean Coal	200	2008	Cebu
Visayas	Tredo Power Exp.Project	100	2008	Cebu
Visayas	BOGO Bioenergy	25	2008	Boao, Cebu
Visayas	Cabalian Geo Phase 1	50	2010	So. Leyte
Visayas	Cabalian Geo Phase 2	40	2011	So. Leyte
Visayas	Dauin Geo Project	40	2012	Negros
Mindanao	Mt. Apo Geothermal Expansion 1	20	2007	North Cotabato
Mindanao	Cabulig Hydro	8	Dec.2007	Misamis Or.
Mindanao	Minergy Expansion	30	Dec.2007	Cag. De Oro
Mindanao	Mt. Apo Geothermal Expansion 2	50	2008	North Cotabato
Mindanao	Tagoloan Hydro	68	2008	Buidnon
Mindanao	Sultan Kudarat Coal	200	2008	Sultan Kudarat
Total		6521		

Source: DOE

Table 4.3 above includes Pagbilao Coal III (Extension), Kepco Clean Coal and Sultan Kudarat Coal which have been attracting interest from investors. The fact shows some of the potential investors have already started preparing investment plans. However, most of the other investors are adopting a wait-and-see attitude on the privatization of power generation assets.

4.2.3 Plants for Retirement

The retirement plan for various aging plants is shown in Table 4.4. The retirement of old diesel power plants is a rational decision because the operation has become very costly.

Table 4.4 Plants for Retirement

	Project name	Capacity MW	year
Luzon	Hopewell GT	210	2009
Luzon	Malaya 1	300	2010
Luzon	Malaya 2	350	2010
Visayas	PB 101	32	2005
Visayas	Bohol DPP	22	2005
Visayas	Panay DPP	36.5	2007
Visayas	PB 103	32	2009
Visayas	PB 104	32	2009
Visayas	Cebu LBGT	55	2011
Visayas	Cebu DPP 1	43.8	2011
Total		1113.3	

Source:DOE

4.3 PDP Simulation

4.3.1 Calculation Condition Deference for the PDP (2005-2014)

A comparison of the relevant parameters of the PDP for two periods, that is 2004 – 2013 and 2005 -2014 is presented in Table 4.5.

Table 4.5 Difference of Data between the PDP (2005-2014) and the PDP (2004-2013)

Items	PDP（2005-2014）	PDP（2004-2013）
Duration Curve	Actual 2003	Actual 1996
Dependable Capacity	Actual at the end of year 2003	Actual at the end of year 2002
Fuel Price	Latest NPC purchase Price (Year 2003 Price)	Latest NPC purchase Price (Year 2002 Price)
Committed Project	Latest plan prepared by DOE	Latest plan prepared by DOE then
Existing Plant	Latest list prepared by DOE (DDP data is reflected on the list)	Latest list prepared by DOE then

- Duration curve used for the PDP (2004-2013) has been used since 1997. For preparing the PDP (2005-2014), the data was updated to data of year 2002. The data should not be revised every year since the data is set as the “normal data” for the consistency of the plan. Therefore the duration data don’t have to be updated during the next five (5) years.
- Dependable capacity changes every year along with the change of equipment's condition or maintenance situation. Therefore, the DOE has to revise them again next year for the rolling of the PDP.
- Energy price issues are described in section 4.4.4. The DOE used the bidding price of NPC. Since the bid price moved along with the the current increase in coal and oil price, the development plan consists of many gas-fired combined cycle power plants.
- Committed projects are being determined by the DOE every year thus far, and the DOE may continue preparing this in the coming years. Actually, the DOE determines the commissioning year not only through technical evaluation, but also by the political issues as well.
- Data for existing plants can be collected more precisely next year by making full use of DDP as the

data source. Especially, the location or connected point of barge generator should be tracked exactly because they can be transferred easily. It is the one of the peculiar issues in the Philippines.

4.3.2 To Revise Data / Not to Revise Data

For the PDP (2005-2014), most unit data used were the same as the previous year data except for dependable capacity and fuel price, because of the following reasons:

(1) Unit Efficiency Curve. Unit efficiency can be replaced or updated using the system performance report released by TRANSCO. PDP (2005-2014), used the same data as the PDP (004-2013) because :

① Unit thermal efficiency is affected by the actual operation pattern of the unit.
② Unit efficiency curve does not change drastically every year.

Instead, the thermal efficiency at maximum capacity changes automatically by substituting with the dependable capacity.

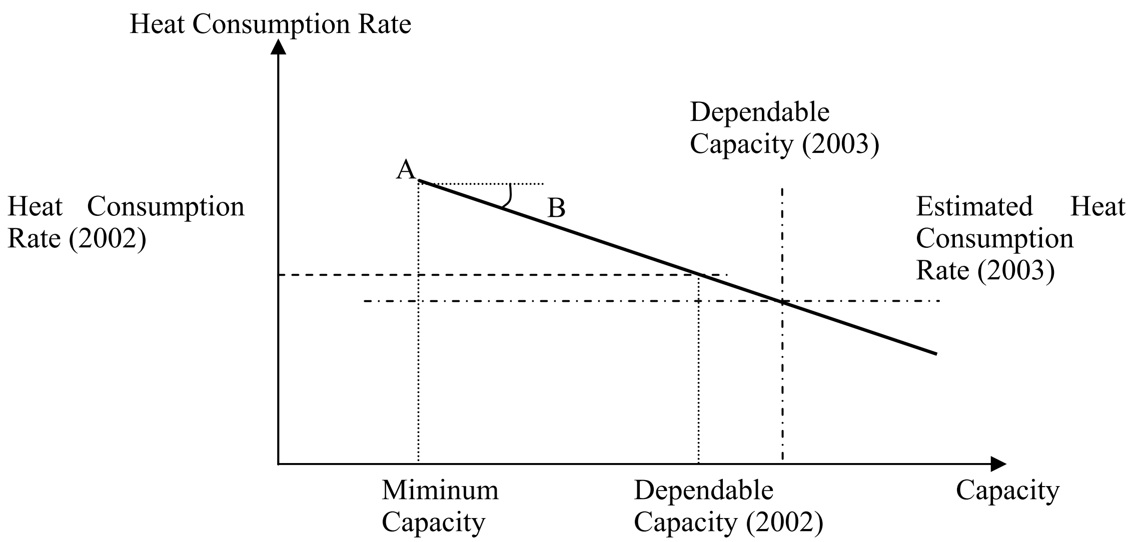


Figure 4.1 Unit Thermal Efficiency Curve

Figure 4.1 shows the heat consumption rate used in WASP-IV. The WASP-IV already has the heat consumption curve from the 2002 data, and the curve did not change drastically. Therefore, the heat consumption rate at maximum operation point changes automatically by changing the dependable capacity. On the other hand, a unit in service is likely to operate at its maximum operation point. Therefore, it is accurate enough for the simulation to change the heat efficiency by changing the dependable capacity.

Of course, the curve itself will change due to deterioration and maintenance, so that the curve should be updated regularly. However, the impact of updating the curve is at most 1% of the operation cost, while the impact of energy price is more pronounced. Therefore, the DOE has to determine the energy price appropriately before establishing the heat consumption curve.

(2) Forced Outage Rate. The DOE sets the criteria for determining the required capacity at LOLP（Loss of Load Probability）＝1day/year for the PDP. With this criteria, the unit forced outage rate is affected with the result of calculation. The forced outage occurs only once a couple of years. As a result, the annual forced outage rate will be changed dramatically if an outage occurs. Therefore the, forced outage rate used in the simulation should be a statistical data based on several annual data.

For the PDP（2004-2013）, JICA study team replaced the data by using the moving average for three years(2000-2002). Although the data replacement was not conducted for the PDP(2005-2014）, the rate should be corrected and arranged appropriately every year and updated, if necessary.

4.3.3 PDP Trial Calculation

(1) Demand Forecast used in the Trial Calculation

The DOE calculated the PDP based on two demand scenarios, namely, (i) demand forecasting by aggregating the DU forecast demands and (ii) demand forecasting based on the Macro econometric method.

The DOE determined the demands used for the PDP deliberately from the viewpoint not only of the technical aspects such as reliability, but also the economic impacts. As a result, the peak demand for Luzon was based on macroeconometric method, while Visayas and Mindanao were based on the DDP aggregation. Considering the sever impact of potential power deficit in Luzon on the national economic situation, this choice seems much reasonable. Table 4.6 shows the demand forecast for the PDP(2005-2014)

Table 4.6 Demand forecast (PDP(2005-2014)

Year	Luzon	Visayas	Visayas Island(Coincident Peak)					Mindanao	Philippine Total
			Cebu	Panai	Negros	Bohol	Leyte-Samar		
2003	6,365	1,006	414	187	189	44	172	1,166	8,537
2004	6,829	1,060	439	199	199	46	177	1,271	9,160
2005	7,343	1,113	460	212	209	47	185	1,371	9,827
2006	7,964	1,170	483	226	219	50	193	1,458	10,592
2007	8,635	1,238	509	243	231	53	202	1,535	11,408
2008	9,372	1,308	537	262	242	55	211	1,615	12,295
2009	10,171	1,383	566	283	256	58	219	1,697	13,251
2010	11,018	1,463	597	305	270	62	229	1,784	14,265
2011	11,917	1,550	630	331	286	65	238	1,883	15,350
2012	12,871	1,644	664	360	301	70	249	2,001	16,516
2013	13,884	1,742	701	389	317	74	260	2,124	17,750
2014	14,959	1,849	742	420	335	79	273	2,256	19,064

Note: Macroeconometric method was used for the demand forecasting for Luzon.
DDP aggregation method was used for the demand forecasting for Mindanao and Visayas.

(2) Power Development Plan for the Luzon Area

Similar to the previous year PDP preparation, simulation was conducted for the three different areas such as, Luzon, Visayas and Mindanao. Table 4.7 shows the PDP for Luzon area. In the chart, the committed projects are treated as existing capacities. Aside from the committed projects, the necessary capacity addition（2005-2014) reaches 7,200MW.

On the type of power plant for capacity addition, the simulation result says indicates that capacity addition are mainly combined cycle power plant, meanwhile the previous plan consisted of coal fired power plants. The surge in coal prices make the coal-fired power plants less cost-effective option. The appropriate energy price should be discussed in future, considering the present energy price.

Table 4.7 Power Development for Luzon Area

Luzon								
	Demand	Ex.Cap	Install Cap.				Total	G.R.M
			GT15	CC30	CL30	Acc		
2004	6,829	9570				0	9570	40.1%
2005	7,343	11436				0	11436	55.7%
2006	7,964	11438				0	11438	43.6%
2007	8,635	11438				0	11438	32.5%
2008	9,372	11438	150			150	11588	23.6%
2009	10,171	11258	450	600		1200	12458	22.5%
2010	11,018	10608	150	1500		2850	13458	22.1%
2011	11,917	10608	450	600		3900	14508	21.7%
2012	12,871	10608	150	900		4950	15558	20.9%
2013	13,884	10608	150	900		6000	16608	19.6%
2014	14,959	10608		1200		7200	17808	19.0%

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

(3) Power Development Plan for Visayas

The PDP for the Visayas area is presented in Table 4.8. In 2003 , power deficit in Panay - Negros island in Visayas area was predicted and it was recognized , that urgent power development projects are necessary. As a result, some power plants, such as the diesel power plants of Mirant, were prepared, and it is expected that the power deficit will be relieved.

As in Luzon PDP, the committed projects are treated as existing generation capacities. Necessary capacity addition for the 2005-2014 reaches 600MW. In the previous plan, the necessary capacity addition（2004-2013） was estimated at 900MW. In order to augment the power supply in the region, the interconnection between Cebu- Negross- Panay is constructed. Figures 4.2 - 4.4 show demand -supply balances of Visayas area in 2010 considering the power flow between islands. It seems that the reinforcement of the transmission line allows for the utilization of geothermal power plants in Leyte during midnight.

Table 4.8 Power Development Plan For Visayas Area

Visayas Grid

	Leyte-Samar Grid							
	Demand	Ex.Cpa	Install	Acc	I.C. Out	Total	G.R.M	TL
2004	177	639		0	-209	430	142.3%	440
2005	185	639		0	-253	386	108.8%	440
2006	193	639		0	-320	319	65.9%	440
2007	202	639		0	-319	320	58.5%	440
2008	211	639		0	-245	394	86.3%	440
2009	219	639		0	-317	322	46.8%	440
2010	229	639		0	-321	318	39.1%	440
2011	238	639		0	-315	324	36.2%	440
2012	249	639		0	-304	335	34.8%	440
2013	260	639		0	-292	347	33.2%	440
2014	273	639		0	-274	365	33.8%	440

	Bohol									
	Demand	Ex.Cpa	Install				I.C.	Total	G.R.M	TL
			DS	GT05	CL05	acc				
2004	46	48				0	9	57	25.0%	35
2005	47	6				0	53	59	25.0%	100
2006	50	6				0	56	62	25.0%	100
2007	53	6				0	60	66	25.0%	100
2008	55	6				0	63	69	25.0%	100
2009	58	6				0	66	72	24.0%	100
2010	62	6				0	66	72	17.3%	100
2011	65	6		50		50	19	75	15.2%	100
2012	70	6				50	24	80	14.7%	100
2013	74	6				50	29	85	14.0%	100
2014	79	6				50	35	91	15.5%	100

	Cebu Grid										
	Demand	Ex.Cpa	Install				I.C.		Total	G.R.M	TL
			DS	GT05	CL05	acc	in	out			
2004	439	376.0				0	200	-30	546	24.4%	200
2005	460	376.0				0	200	-5	571	24.0%	200
2006	483	376.0				0	264	-35	604	25.0%	400
2007	509	376.0				0	259	2	637	25.0%	400
2008	537	376.0				0	182	113	671	25.0%	400
2009	566	376.0				0	251	75	702	24.0%	400
2010	597	376.0				0	255	70	700	17.3%	400
2011	630	296.0		100		100	296	34	726	15.2%	400
2012	664	296.0		100		200	280	-14	762	14.7%	400
2013	701	296.0		50		250	264	-10	799	14.0%	400
2014	742	296.0		100		350	239	-28	857	15.5%	400

	Negros										
	Demand	Ex.Cap	Install Cap.				I.C.		Total	G.R.M	TL
			DS	GT05	CL05	Acc	in	out			
2004	199	180		50		50	30	-11	249	25.0%	80
2005	209	180				50	5	26	261	25.0%	80
2006	219	180				50	35	8	273	25.0%	80
2007	231	270				50	-2	-30	288	25.0%	160
2008	242	320				50	-113	47	303	25.0%	160
2009	256	320				50	-75	23	317	24.0%	160
2010	270	320				50	-70	17	317	17.3%	160
2011	286	320				50	-34	-7	329	15.2%	160
2012	301	320				50	14	-39	345	14.7%	160
2013	317	320				50	10	-19	361	14.0%	160
2014	335	320				50	28	-11	387	15.5%	160

	Panay									
	Demand	Ex.Cap	Install Cap.				I.C.	Total	G.R.M	TL
			DS	GT05	CL05	Acc				
2004	199	237.2				0	11	249	25.0%	80
2005	212	290.8				0	-26	265	25.0%	80
2006	226	290.8				0	-8	283	25.0%	80
2007	243	274.2				0	30	304	25.0%	160
2008	262	274.2			100	100	-47	328	25.0%	160
2009	283	274.2				100	-23	351	24.0%	160
2010	305	274.2				100	-17	357	17.3%	160
2011	331	274.2				100	7	381	15.2%	160
2012	360	274.2				100	39	413	14.7%	160
2013	389	274.2		50		150	19	443	14.0%	160
2014	420	274.2		50		200	11	485	15.5%	160

	Total								
	Demand	Ex.Cpa	Install				I.C.	Total	G.R.M
			DS	GT05	CL05	acc			
2004	1,060	1,480				0	0	1,480	39.7%
2005	1,113	1,492				0	0	1,492	34.0%
2006	1,170	1,492				0	0	1,492	27.5%
2007	1,238	1,565				0	0	1,565	26.4%
2008	1,308	1,615			100	100	0	1,715	31.1%
2009	1,383	1,615				100	0	1,715	24.0%
2010	1,463	1,615				100	0	1,715	17.3%
2011	1,550	1,535		150		250	0	1,785	15.2%
2012	1,644	1,535		100		350	0	1,885	14.7%
2013	1,742	1,535		100		450	0	1,985	14.0%
2014	1,849	1,535		150		600	0	2,135	15.5%

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

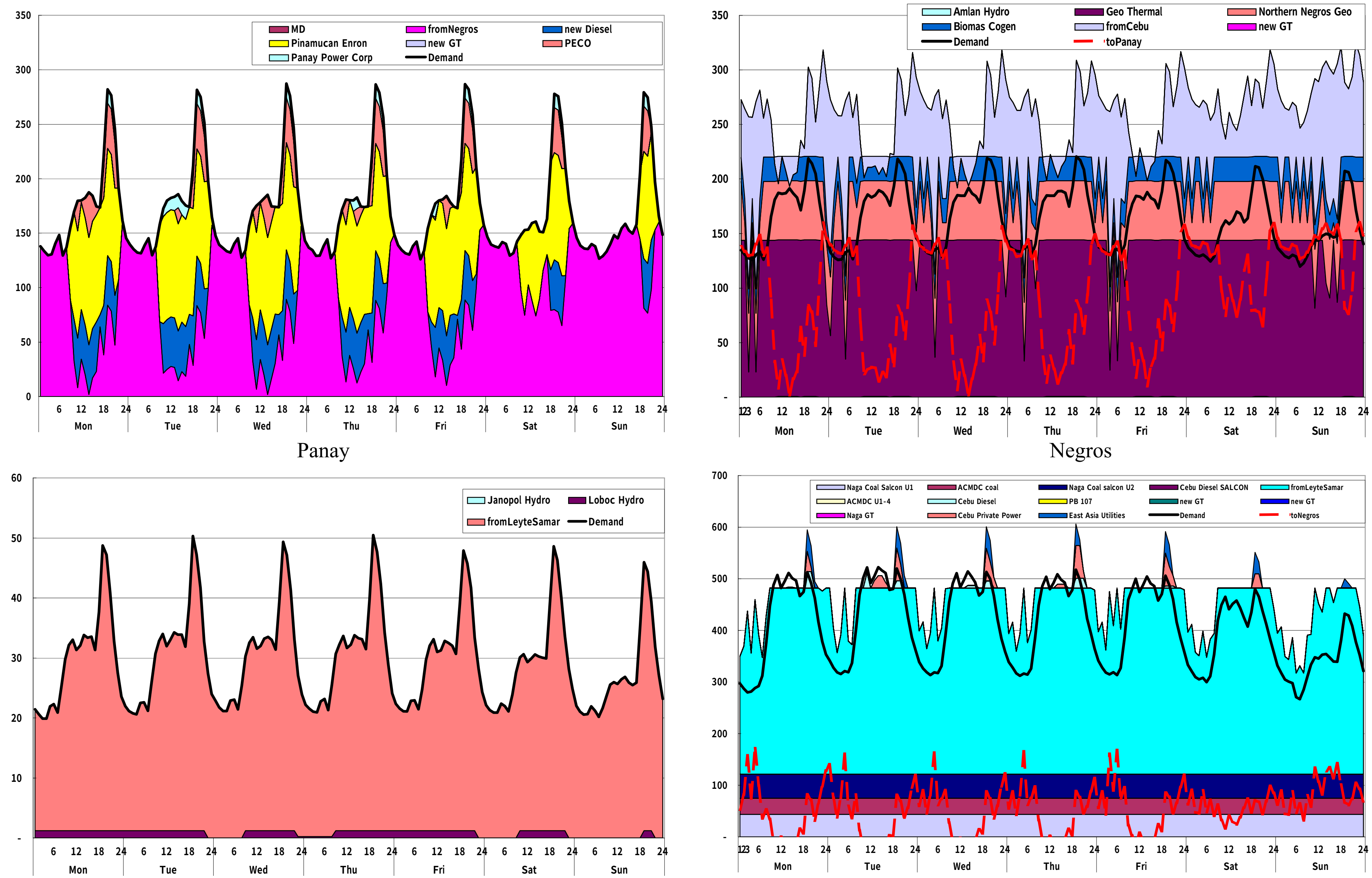


Figure 4.2 Demand -Supply Balance in Visayas Area（in 2010)

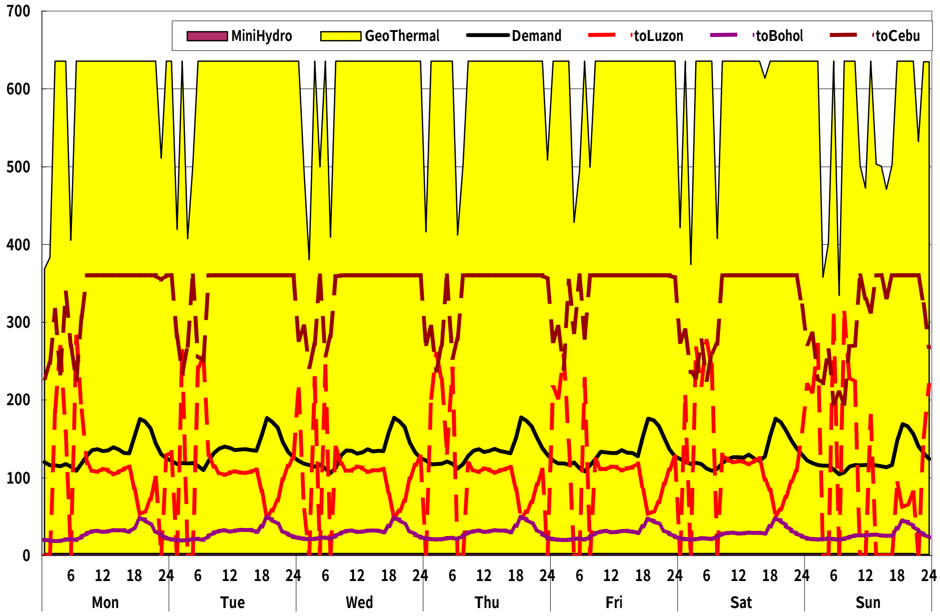


Figure 4.3 Demand Supply Balance in Leyte-Samar(in 2010)

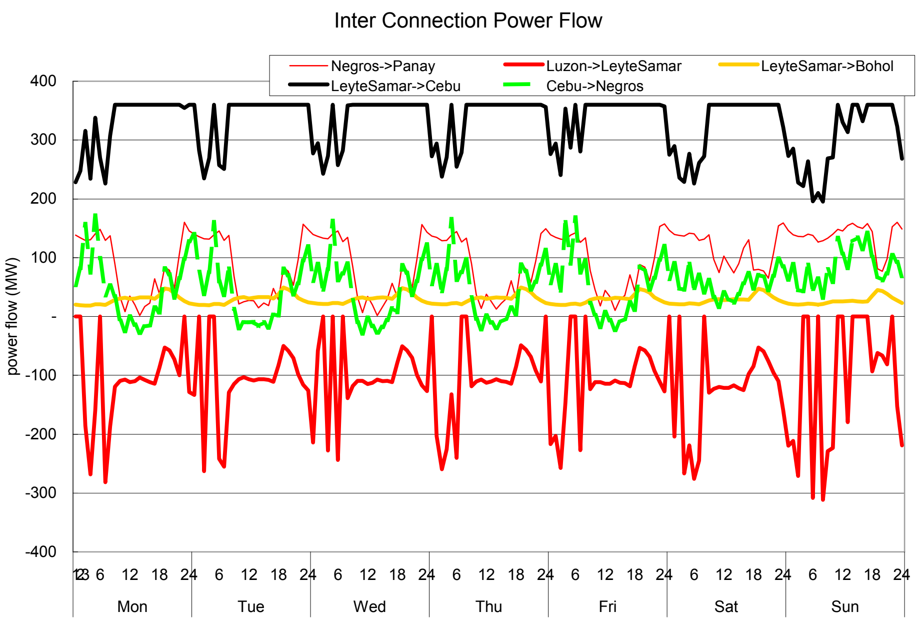


Figure 4.4 Interconnection Power Flow (in 2010)

(4) Power Development Plan in Mindanao

The Table 4.9 below shows the Power Development Plan for Mindanao Area. Considering the sudden rise of demand in 2003, the forecasted demand for Mindanao area increases drastically. The result of the review revealed that the necessary capacity addition for Mindanao for the period 2005 - 2014 is increased to 850MW aside from the committed projects. In the previous plan, the necessary capacity addition（2004 - 2013） was estimated at 550MW.

As described in Chapter 3, the rapid growth of demand affects with the result.

Table 4.9 Power Development Plan for Mindanao

Mindanao								
	Demand	Ex.Cap	Install Cap.				Total	G.R.M
			DS	GT05	CL05	Acc		
2004	1,278	1629				0	1629	27.5%
2005	1,374	1704		150		150	1854	34.9%
2006	1,460	1679		100		250	1929	32.1%
2007	1,536	1889			100	350	2239	45.8%
2008	1,615	1889			50	400	2289	41.7%
2009	1,697	1839			50	450	2289	34.9%
2010	1,784	1839			50	500	2339	31.1%
2011	1,891	1839			50	550	2389	26.3%
2012	2,010	1839			100	650	2489	23.8%
2013	2,125	1839			50	700	2539	19.5%
2014	2,249	1839			150	850	2689	19.6%

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

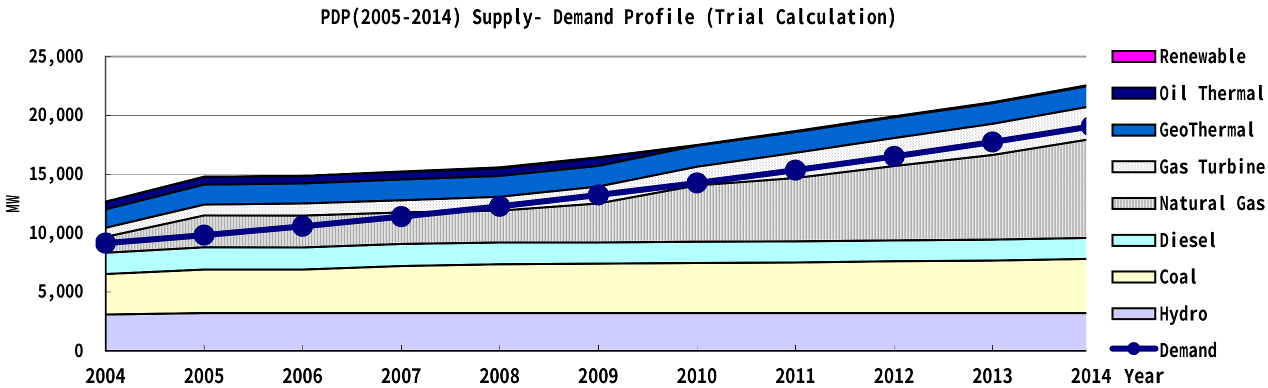
(5) Profile of Supply Capacity and Power Generation

Table 4.10 shows the details of total capacity addition, both the committed and indicative projects, in the three (3) main islands. The total capacity addition is computed at 9,225MW of which about 95% are only indicative projects.

Table 4.10 Total Capacity Additions (PDP2005-2014)

	Luzon	Visayas	Mindanao	Philippines
Comitted Projects	65	225	285	575
Indicative Requirement	7,200	600	850	8,650
Base Load		100	600	700
Midrange	5,700			5,700
Peaking	1,500	500	250	2,250
Total	7,265	825	1,135	9,225

Figure 4.5 and Figure 4.6 show profiles of supply capacity and power generation.

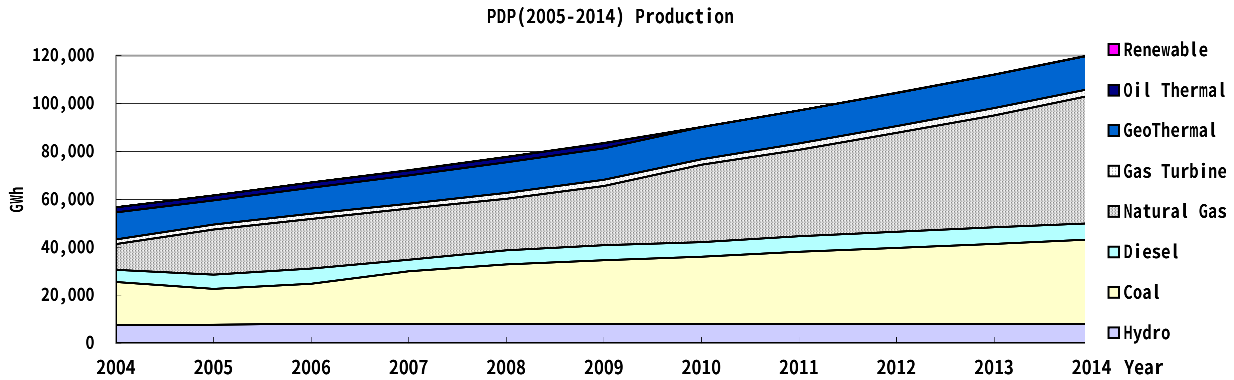


(Unit:MW)

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Demand	9,160	9,827	10,592	11,408	12,295	13,251	14,265	15,350	16,516	17,750	19,064
Total Supply	12,670	14,791	14,866	15,241	15,591	16,461	17,511	18,681	19,931	21,131	22,631
Reserve Margine	38.3%	50.5%	40.3%	33.6%	26.8%	24.2%	22.8%	21.7%	20.7%	19.0%	18.7%
Coal	3,426	3,691	3,691	4,001	4,151	4,201	4,251	4,301	4,401	4,451	4,601
Diesel	1,801	1,906	1,881	1,856	1,856	1,806	1,806	1,776	1,776	1,776	1,776
Natural Gas	1,353	2,703	2,703	2,703	2,703	3,303	4,803	5,403	6,303	7,203	8,403
Gas Turbine	770	920	1,020	1,020	1,170	1,440	1,590	2,140	2,390	2,640	2,790
GeoThermal	1,568	1,703	1,703	1,763	1,763	1,763	1,763	1,763	1,763	1,763	1,763
Oil Thermal	650	650	650	650	650	650	0	0	0	0	0
Hydro	3,102	3,217	3,217	3,217	3,217	3,217	3,217	3,217	3,217	3,217	3,217
Renewable	0	1	1	31	81	81	81	81	81	81	81

Figure 4.5 Profile of Supply Capacity

Figure 4.6 shows the profile of power generation. In 2005 and 2006, the power generation of coal fired power plant decreased due to increase in coal price.



(Unit:MW)

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total Supply	56,649	61,678	67,054	72,198	77,716	83,510	90,246	97,122	104,462	112,176	120,389
Coal	17,995	14,954	16,737	21,927	24,697	26,531	27,924	30,043	31,704	33,276	35,188
Diesel	5,070	6,002	6,325	4,805	5,936	6,249	6,104	6,482	6,696	6,927	6,715
Natural Gas	10,764	18,848	20,705	21,391	21,520	24,665	32,297	36,048	41,238	46,695	53,465
Gas Turbine	1,991	2,040	2,236	1,984	2,410	2,585	2,308	2,709	2,794	3,098	2,805
GeoThermal	11,233	10,092	10,844	11,863	12,867	13,193	13,427	13,654	13,844	13,994	14,030
Oil Thermal	2,101	2,056	2,080	2,099	2,101	2,101	0	0	0	0	0
Hydro	7,495	7,617	8,046	8,047	8,101	8,101	8,101	8,101	8,101	8,101	8,101
Renewable	0	69	81	82	84	85	85	85	85	85	85

Figure 4.6 Profile of Power Production

4.4 Methodology to Solve the Technical Issues

In preparing the PDP, the DOE has to conduct the sensitivity study on fuel price impact, environmental issues etc. This chapter discusses possible methodologies to solve the technical issues confronting DOE..

4.4.1 Sensitivity study on the fuel price impact

(1) Back Ground

As mentioned earlier, the DOE sets the energy price used in the PDP, considering the latest bidding price of NPC. Table 4.11 shows the fuel prices used in the PDP（2005-2014）and the PDP（2004-2013）.

Table 4.11 Fuel Price Used in the ＰＤＰ

Type of Fuel	PDP（2005-2014）	PDP（2004-2013）
Coal	US$38-52MT	US$25-30MT
Natural Gas	Contract Price	Contract Price
Oil	13.8-19.5Php/L	9.2-13.0 Php/L

The actual bidding price of NPC is US$70MT for imported coal and 20Php/L for bunker oil. Comparing with the actual price, the oil price is at about same level, meanwhile the imported coal price is still cheap. The reasons of sudden rise of energy prices are:

・ or coal, the boom of economic activity in China led to increase in price. The explosion of coal mining in China, resulted to shortage of supply capacity and contributed to further increase in coal prices.
・ For the oil, the shortage of oil supply due to the Iraq war.

Many experts opine that the surge in fuel prices is a one-time phenomenon and may go down in the long-term. Therefore, the energy price for the PDP should be treated considering the following:

・ Applying the present price levels may cause drastic change in the PDP .. Since the PDP is a guidebook to investors, the PDP should be conservative in treating the sudden surge in fuel price.
・ The DOE has to prepare the energy price forecast first based on their energy strategy. This energy price forecast will then be used to develop the PDP.

(2) Study flow

Simulation should be conducted by changing the fuel price, considering the loading order. In more concrete terms , the input to WASP-IV should be conducted considering the calculation flow of loading order.

Figure 4.7 shows the calculation flow of WASP-IV. Fuel price can be input to FIXSYS and VARSYS directly and also to DYNPRO as a coefficient. Many WASP-IV operators are likely to input to DYNPRO because of its simplicity. When inputting to DYNPRO, the loading order of units are not changed as shown in Figure. 4.7. This means the development is determined based on the wrong loading order (= production).

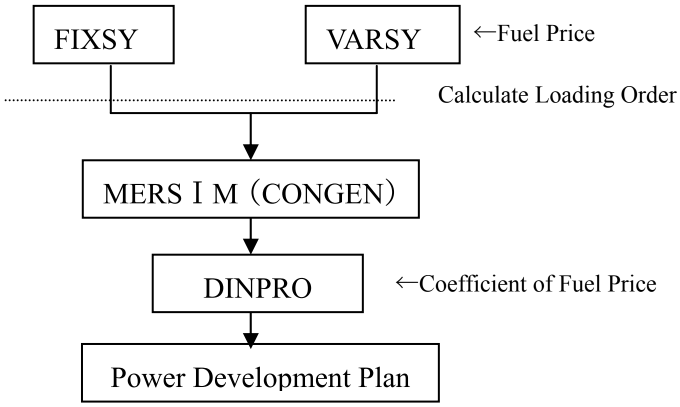


Figure 4.7 Calculation Flow

Therefore, if a change in loading order is expected between coal and natural gas, the fuel price should be changed by replacing the data in FIXSYS・VARSYS, not by changing the coefficient in DYNPRO. Meanwhile the rise of oil price does not affect the loading order. In this case, the change of coefficient in DYNPRO is much accurate. Table 4.12 shows the concept of calculation.

Table 4.12 Fundamental Concept of Fuel Price Simulation

Fuel Type	Loading Order	Fundamental Concept	Data Input To:
Coal	1 (Base Load)	Changing the Loading order is necessary if the price increase.	FIXSYS、VARSYS
Gas	2	Contract Price	Not Applicable
Oil	3 (Peak Load)	Changing the Loading order is unnecessary if the price increase.	FIXSYS、VARSYS (DYNPRO is available)

4.4.2 Dry Condition

(1) Back Ground

The Philippines was hit by unusual dry condition in latter half of 2003. Especially in Mindanao, the decrease of dependable capacity caused by dry condition affected the supply capacity because hydro-electric power plants account for about half of the supply capacity. Considering this, the DOE requested JICA study team to teach them how to treat the issue. In this section, the use of WASP-IV to handle the issue is described.

(2） Study Flow

Figure 4.8 shows the study flow for the dry condition. Actually, the WASP-IV contains unit data for the dry condition, and calculated it to determine the optimal power development requirement. The previous PDP requirement was determined by computing the weighted average of operation costs for both the normal season (66%) and dry season (34%). The weight can be changed in Common Data Input Screen.

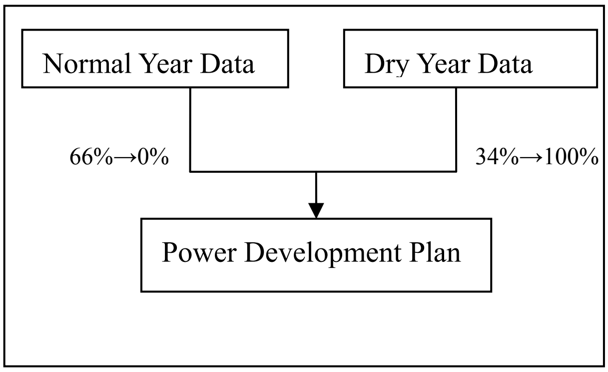


Figure 4.8 Study flow for the dry condition

Therefore, the calculation for the dry season can be conducted to change the weighted value as follows:

Normal Year (66%→0%) , Dry Year (34%→100%)

4.4.3 Environmental Impact

The DOE requested JICA study team to explain the procedure for calculating the environmental impact. The JICA study team advised DOE to use excel-base spreadsheet. In this manner, the result can be calculated to multiply the emission unit with the fuel consumption. However, if the CO2 credit is assumed specifically (e.g. US$5 / ton), the cost can be reflected to the fuel price. The methodology was already discussed in section 4.4.2.

4.4.4 Small Area Studies

The PDP is prepared for seven (7) areas, one (1) for Luzon, five (5) for Visayas and one (1) for Mindanao. In the process of PDP preparation, the DOE requested JICA to divide areas into ten (10) areas, such as three (3) for Luzon, five (5) for Visayas and two (2) for Mindanao. Table 4.13 shows the present and requested area for the PDP.

Table 4.13 Study Area for the PDP

Area	PDP（2005-2014）	DOE's Request
Luzon	1 Area (Whole Luzon)	3 Areas (North Luzon, Metro-Manila and South Luzon)
Visayas	５Areas (Leyte-Samar, Cebu, Bohol, Negross and Panay)	５Areas (Leyte-Samar, Cebu, Bohol, Negross and Panay)
Mindanao	1 Area (Whole Mindanao)	2 Areas (North Mindanao and South Mindanao)

The reason why the DOE would like to divide the area into the smaller areas are as follows:

・ For Luzon, the capacity of transmission line between Batangas and Manila is not enough to transmit the power. In addition, the DOE would like to study the necessity of transmission line reinforcement between north Luzon and Metro-Manila under the condition that power sources are concentrated in North Luzon in the future;.

・ For Mindanao, the load center (Davao) is located in South Mindanao, while the power sources are located in North Mindanao. In addition the capacity of transmission line between these areas is not enough to transmit the power.

Considering the required accuracy for the study, the JICA study team determined not to conduct these studies and explained to the DOE as follows:

・ The study team can understand the necessity of the requested studies, however, there are some conditions reiterated in the request that have been addressed; for example the capacity of transmission line between Batangas and Metro-Manila will be upgraded in 2006.

・ The load curve to meet each area is not available. Calculation can be done by assuming that the load shape is the same as Metro-Manila; however the result is not reliable.

・ The necessary work for dividing area is too much to manage every year in the DOE. Meanwhile the result of the study is limited.

A similar study may be required by introducing the WESM. Therefore the study should be conducted efficiently by using the data acquired from WESM, if necessary.

5. Transmission Development Program

The JICA Study Team conducted a study on stability in the Luzon system for a technical transfer to the DOE as well as for evaluation of the TDP2005. The results of the study are described in this chapter.

Meanwhile, prioritization of the transmission-line projects in the TDP2005 is a main issue for TRANSCO to reduce its CAPEX. Therefore, this chapter also presents the methodology proposed by the JICA Study Team for prioritization of the transmission-line projects.

5.1 Stability Analysis by Dynamic Simulation

5.1.1 Overview

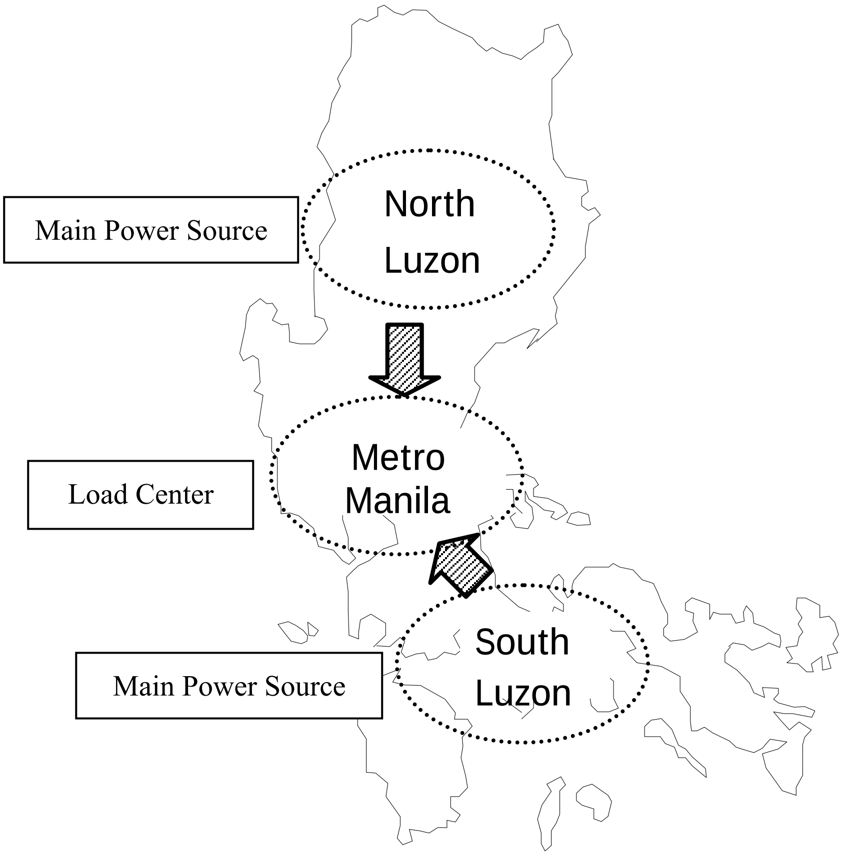


Figure 5.1 Overview of the current Luzon system

In the present Luzon system, main power sources are located in North Luzon and South Luzon because of supply points of primary energy and difficulty in siting power sources. Therefore, huge power is transferred from North Luzon and South Luzon to Metro Manila, the load center of the Luzon system, as shown in Figure 5.1. The Luzon system has no transient stability problem[2] at present. However, such problem may occur in the future if large-scale power plants are excessively developed in North

[2] Transient stability problem is a phenomenon that generators cannot maintain synchronism after a disturbance like a lightning-strike, and this could cause a whole system blackout in the worst case. This is because the electrical connections between the generators become week in case of heavy-loaded and long-distance power transfer.

Luzon or South Luzon.

In this regard, the JICA, during this follow-up study, provided the DOE with the dynamic simulation tool for stability analysis in addition to the PSS/E basic set given during the previous study for power flow calculation and short circuit calculation.

Additionally, the JICA Study Team conducted case studies focusing on dynamic analysis on the North Luzon system (around Labrador substation) and the South Luzon system (around Ilijan power station) for the following purposes:

- Confirmation of the stability limits in the Luzon system for evaluation of the TDP2005; and
- Technical skill transfer to the DOE staff on dynamic simulation.

5.1.2 Study Cases

North Luzon System

Table 5.1, Figures 5.2 and 5.3 show the study cases in North Luzon (around Labrador substation).

Table 5.1 Study Case (North Luzon)

	Explanation
Case 1	Labrador - Hermosa line : 230kV operation（Based on the TDP2004）
Case 2	Labrador - Hermosa line : 500kV upgrade

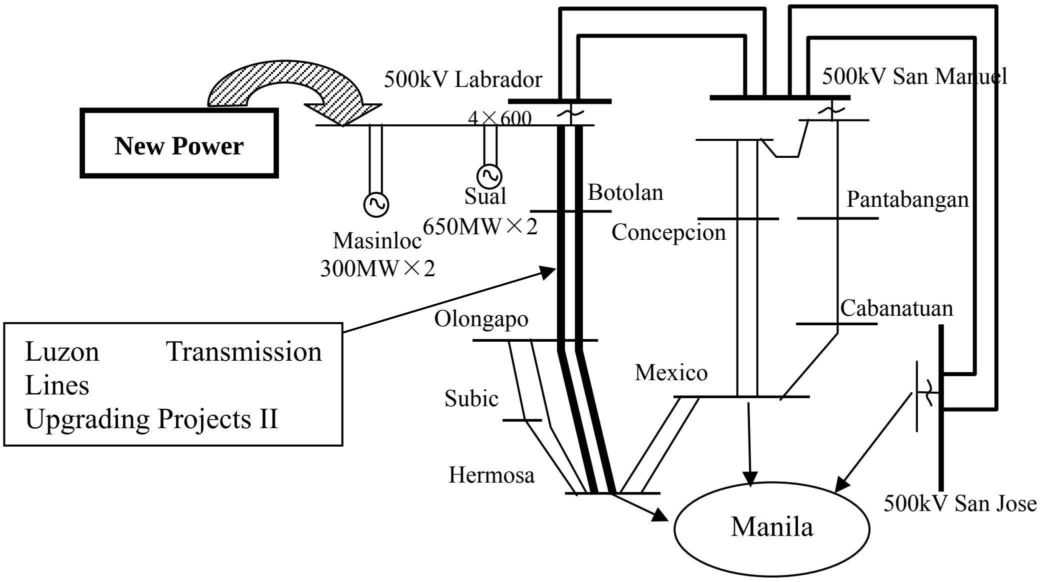


Figure 5.2 System Diagram of North Luzon (Case 1)

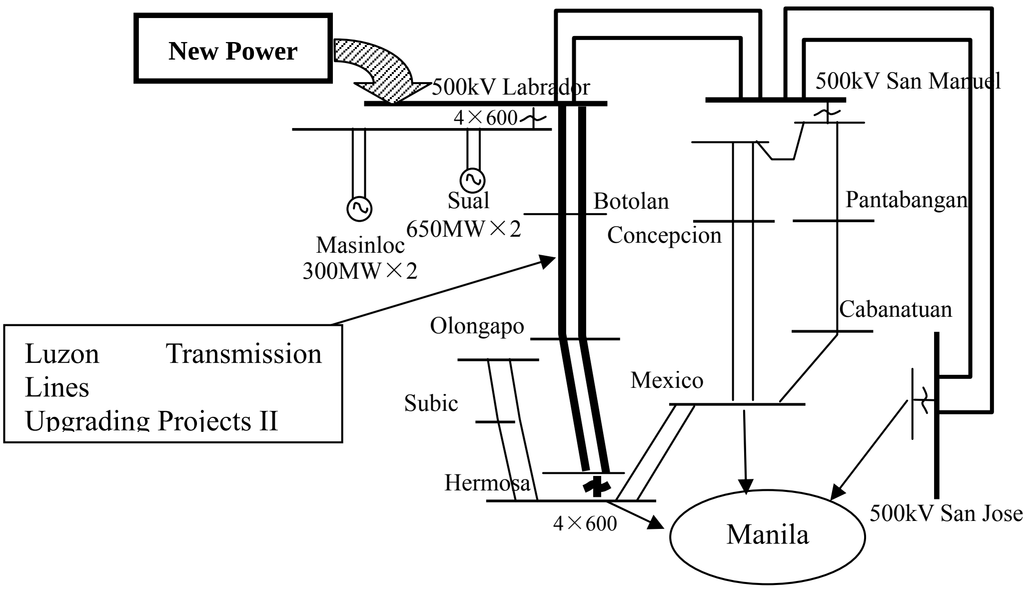


Figure 5.3 System Diagram of North Luzon (Case 2)

South Luzon System

Table 5.2, Figures 5.4 – 5.6, show the study cases in South Luzon (around Ilijan power station).

Table 5.2 Study Case (South Luzon)

	Explanation
Case 1	Present 500kV power system
Case 2	New 500kV Alaminos switching station
Case 3	Ilijan cut-in to Dasmarinas-Tayabas 500kV line (second circuit)

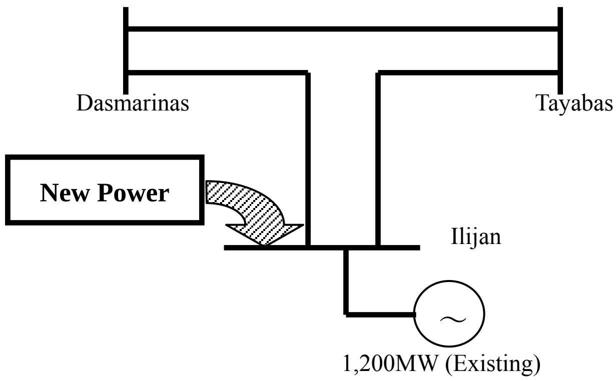


Figure 5.4 System Diagram of South Luzon (Case 1)

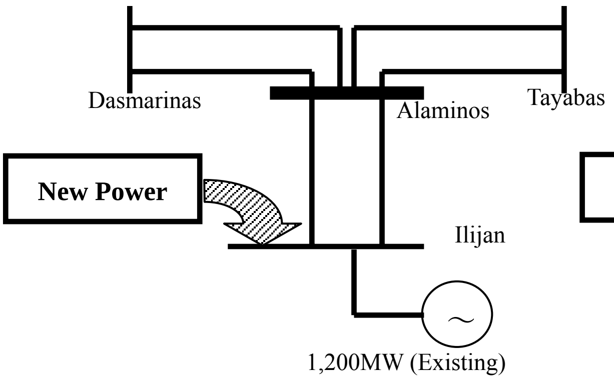


Figure 5.5 System Diagram of South Luzon (Case 2)

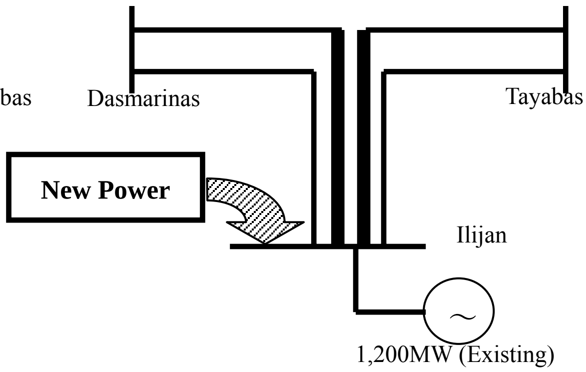


Figure 5.6 System Diagram of South Luzon (Case 3)

5.1.3 Conditions

Table 5.3 shows the conditions for stability analysis.

Table 5.3 Conditions

	Explanation		Remarks
Demand	Around 11,000MW		Peak demand in 2010 (Based on the TDP2004)
Line fault	3ϕ3LG-O		
Fault clearing time	230kV	0.1 s	Based on the Grid Code
	500kV	0.085 s	
Voltage characteristic of the load	Active power: Constant current Reactive power: Constant impedance		
Transmission development plan	Based on the TDP2004		

5.1.4 Study Results on the North Luzon System

Case 1. Table 5.4 and Figure 5.7 show the results of stability analysis in case that new power sources, of which capacities are from 1,800MW to 2,200MW, are developed around Labrador substation (around Sual power station or Masinloc power station).
The results indicate that stability problems will not occur even if power sources, of which total capacity is 2,200MW, are developed.

Table 5.4 Result of Stability Analysis in Case 1

Capacity of Power Development (MW)	In case of a fault on the 500kV transmission line between Labrador S/S and San Manuel S/S (Fault terminal : Labrador S/S)
1,800	Stable
2,000	Stable
2,200	Stable

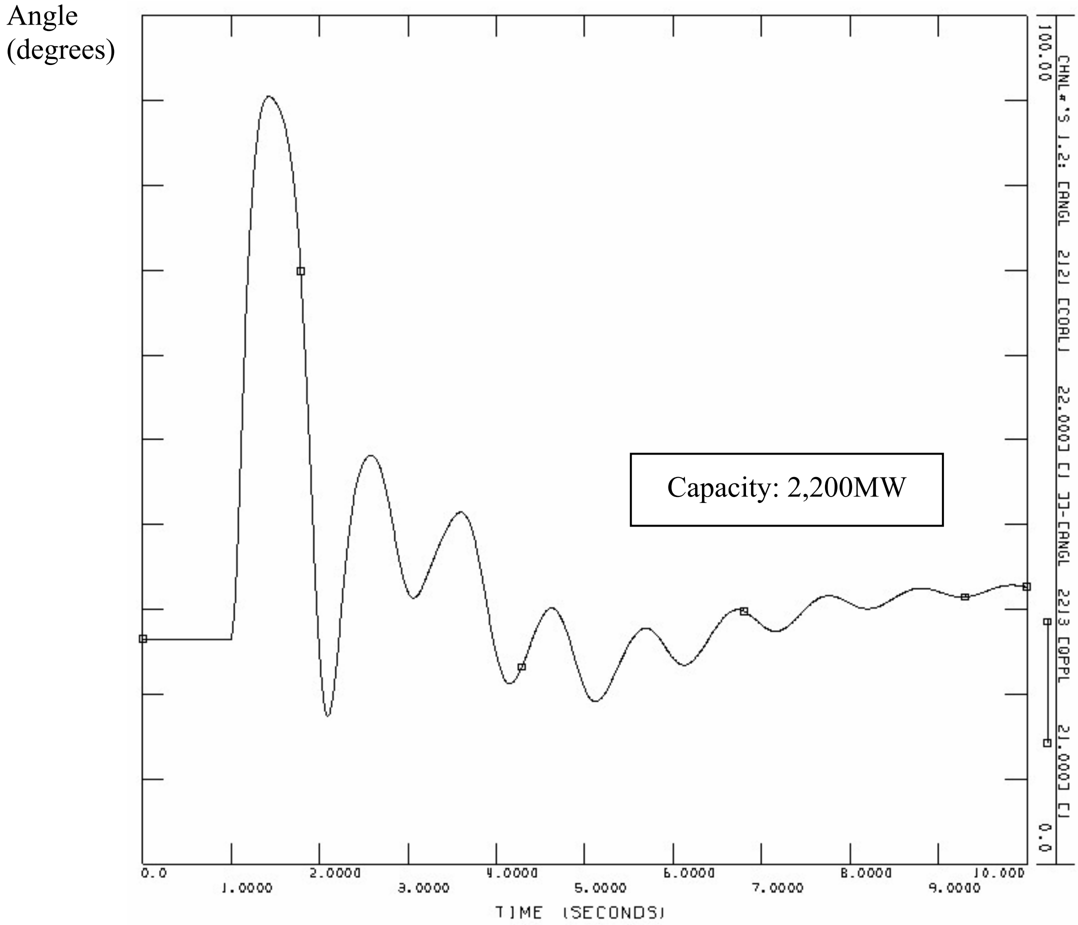


Figure 5.7 Result of Stability Analysis in Case 1

On the other hand, Table 5.5 shows the results of power flow analysis and short circuit analysis under the same condition.

Table 5.5 Result of Power Flow Analysis and Short Circuit Analysis in Case 1

Capacity of Power Development (MW)	Power Flow between 500kV Labrador S/S and 500kV Botolan S/S (In case of a one-circuit failure on the line)		Short Circuit Current at Labrador S/S (230kV bus) (kA)	
1,200	78%	OK	31	OK
1,400	84%	OK	33	Partially N.G.
1,600	90%	OK	33	Partially N.G.
1,800	96%	OK	33	Partially N.G.
2,000	103%	N.G.	35	Partially N.G.
2,200	109%	N.G.	35	Partially N.G.

This indicates that the transmission line between Labrador substation and Botolan substation will be overloaded with a one-circuit failure on the line, in case that 2,000MW or more power sources are developed. In addition, the short circuit currents at the 230kV bus of Labrador substation will partially exceed the breaking capacities (40kA, partially 32kA) of the circuit breakers, in case that 1,400MW or more power sources are developed.

Considering the results, the JICA Study Team conducted a study on 500kV upgrading of the transmission line between Labrador substation and Hermosa substation as a measure against these problems. The results of the study are shown in the next section.

Case 2. Table 5.6 and Figure 5.8 show the results of stability analysis. They indicate that no stability problems will occur in this case like Case 1.

Table 5.6 Result of Stability Analysis in Case 2

Fault	Capacity of Power Development (MW)	Result
500kV transmission line between Labrador S/S and San Manuel S/S (Fault terminal : Labrador S/S)	1,800	Stable
	2,000	Stable
	2,200	Stable
500kV transmission line between Labrador S/S and Botolan S/S (Fault terminal : Labrador S/S)	1,800	Stable
	2,000	Stable
	2,200	Stable

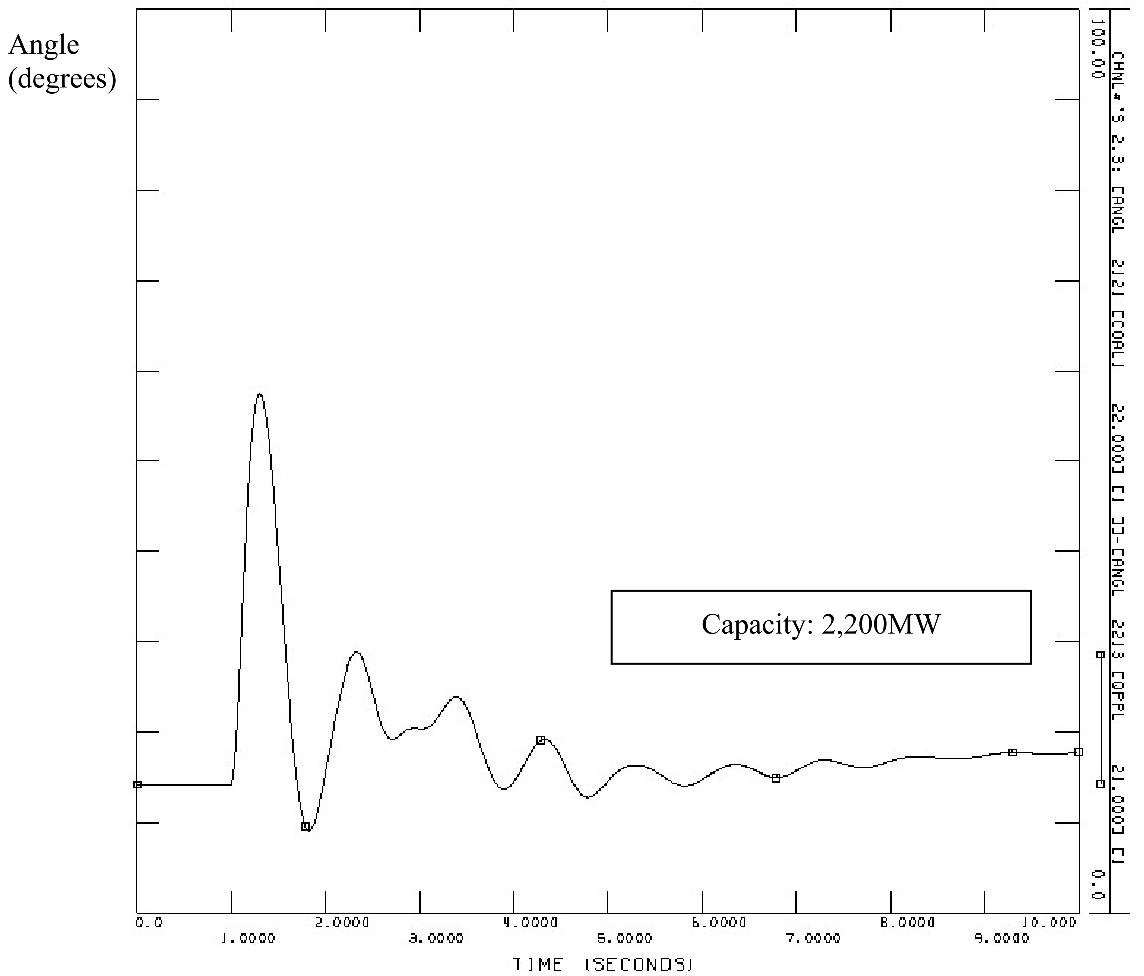


Figure 5.8 Result of Stability Analysis in Case 2
(Fault on the 500kV transmission line between Labrador S/S and San Manuel S/S)

On the other hand, Table 5.7 shows the results of power flow analysis and short circuit analysis under the same condition.

This indicates that the problem on thermal capacity is solved in Case 2. However short circuit at 230kV Labrador substation doesn't reduce considerably. Therefore problem on short circuit capacity is still remaining. To solve this problem, some circuit breakers of which breaking capacity is 32kA need to be upgraded to 40kA.

Table 5.7 Result of Power Flow Analysis and Short Circuit Analysis in Case 2

Capacity of Power Development (MW)	Power Flow between 500kV Labrador S/S and 500kV Botolan S/S (In case of a one-circuit failure on the line)		Short Circuit Current at Labrador S/S (230kV bus) (kA)	
1,200	63%	OK	31	OK
1,400	68%	OK	33	Partially N.G.
1,600	72%	OK	33	Partially N.G.
1,800	77%	OK	33	Partially N.G.
2,000	81%	OK	34	Partially N.G.
2,200	86%	OK	34	Partially N.G.

Summary

Even if about 2,200MW power sources are developed around Labrador substation, stability problems will not occur.

However, in this case, the problems on thermal capacity and short circuit capacity would occur because of concentration of the power development. 500kV upgrading of the transmission line between Labrador substation and Hermosa substation will be effective against the thermal capacity problem. On the other hand, upgrading some circuit breakers at 230kV Labrador substation or split operation of the 230kV system will be effective against the short circuit capacity problem.

5.1.5 Study Result on the South Luzon System

Case 1

Assuming that power development is concentrated around Ilijan power station, the JICA Study Team conducted stability analysis. Figure 5.9 shows the system diagram for Case 1.

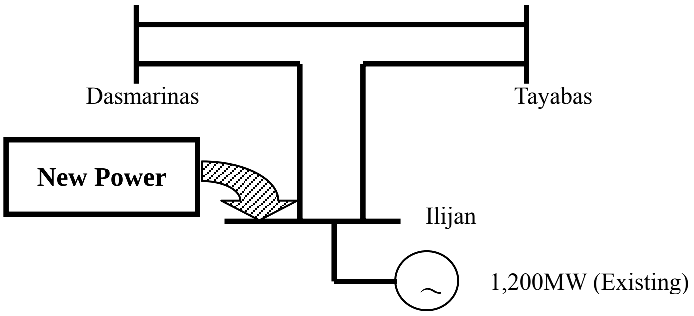


Figure 5.9 System Diagram of South Luzon (Case 1)

Table 5.8 and Figure 5.10 show the results of stability analysis.

Table 5.8 Result of Stability Analysis in Case 1

Fault	Capacity of Power Development (MW)	Result
500kV transmission line between Ilijan P/S and Tayabas S/S (Fault terminal : Ilijan P/S)	1,100	Stable
	1,200	Stable
	1,300	Stable
	1,400	Stable
	1,500	Unstable
500kV transmission Line between Ilijan P/S and Dasmarinas S/S (Fault terminal : Ilijan P/S)	1,100	Stable
	1,200	Stable
	1,300	Stable
	1,400	Stable
	1,500	Unstable

These indicate that stability problems will not occur in case of 1,400MW or less power development. However, in case that 1,500MW or more power sources are developed, a stability problem will occur.

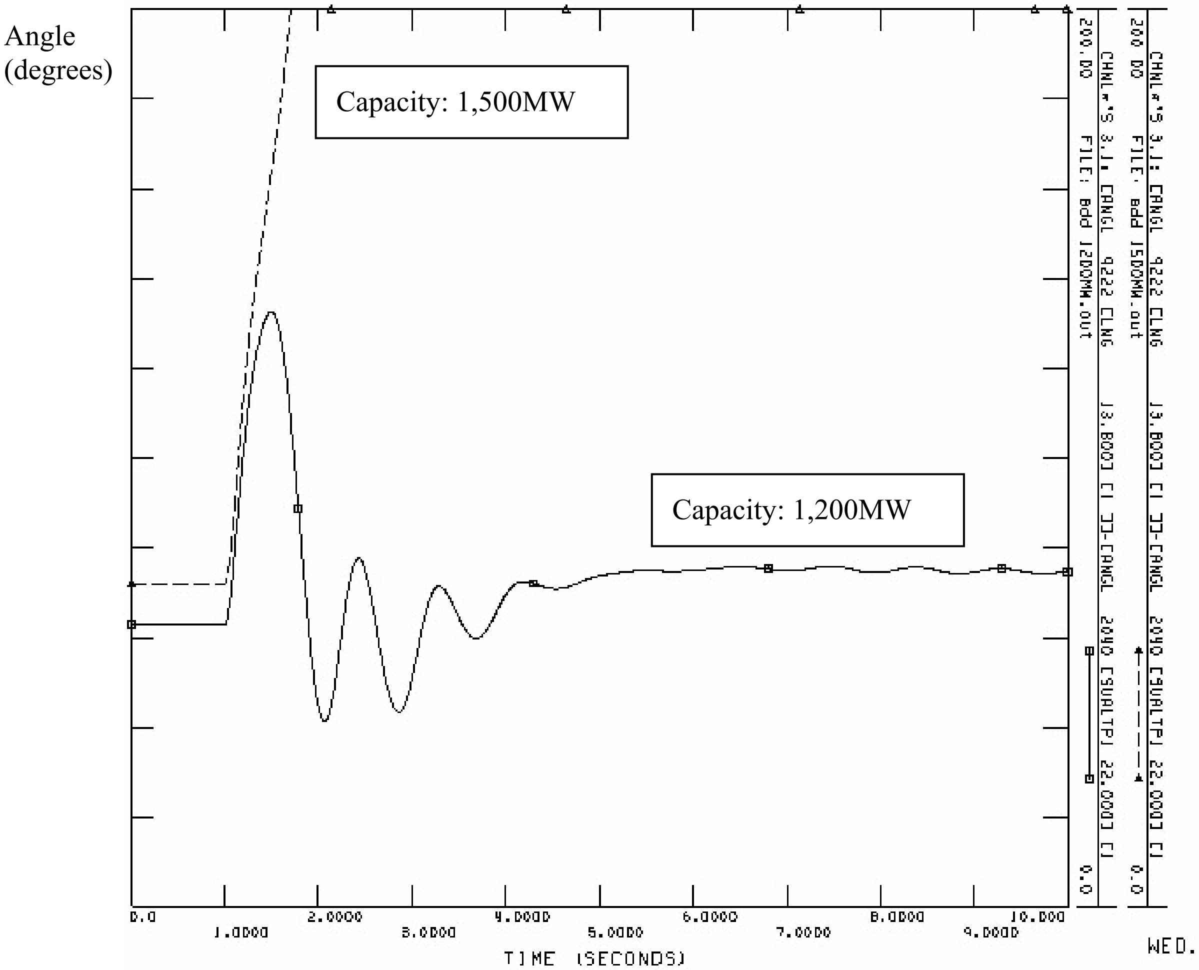


Figure 5.10 Result of Stability Analysis in Case 1

(Fault on the 500kV transmission line between Ilijan P/S and Tayabas S/S)

On the other hand, Table 5.9 shows the results of power flow analysis. The results indicate that the overloading will occur with a failure of the transmission lines, and generation restriction will be necessary, in case that 1,500MW or more power sources are developed.

Table 5.9 Result of Power Flow Analysis in Case 1

Capacity of Power Development (MW)	In case of a failure on the transmission line between Ilijan P/S and Dasmarinas S/S				In case of a failure on the transmission line between Ilijan P/S and Tayabas S/S			
	Ilijan - Tayabas		Dasmarinas - Tayabas		Ilijan - Dasmarinas		Dasmarinas - Tayabas	
1,100	86%	OK	48%	OK	86%	OK	15%	OK
1,200	90%	OK	49%	OK	90%	OK	17%	OK
1,300	94%	OK	49%	OK	94%	OK	19%	OK
1,400	98%	OK	50%	OK	97%	OK	21%	OK
1,500	101%	N.G.	50%	OK	101%	N.G.	24%	OK

Case 2 (New 500kV Alaminos switching station)

Assuming that the Alaminos switching station is constructed as a measure to improve the system stability (Case 2), the JICA Study Team conducted stability analysis. Figure 5.11 shows the system diagram for Case 2.

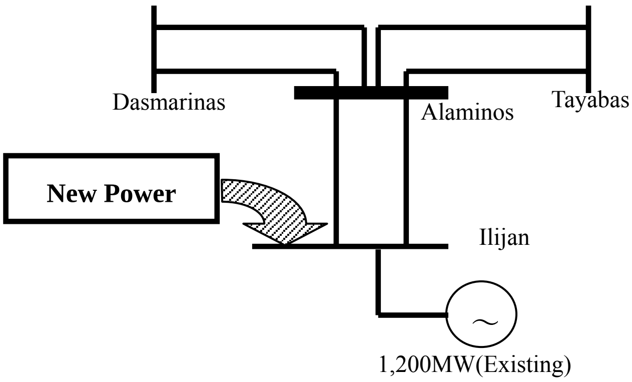


Figure 5.11 System Diagram of South Luzon（Case 2）

Table 5.10 and Figure 5.12 show the results of the stability analysis.

Table 5.10 Result of Stability Analysis in Case 2

Fault	Capacity of Power Development （MW）	Result
500kV transmission line between Ilijan P/S and Alaminos switching station （Fault terminal : Alaminos switching station）	2,000	Stable
	2,100	Stable
	2,200	Stable
	2,300	Stable

This shows that the system is stable, even if 2,300MW power source are developed. The system stability is drastically improved in comparison with Case 1.

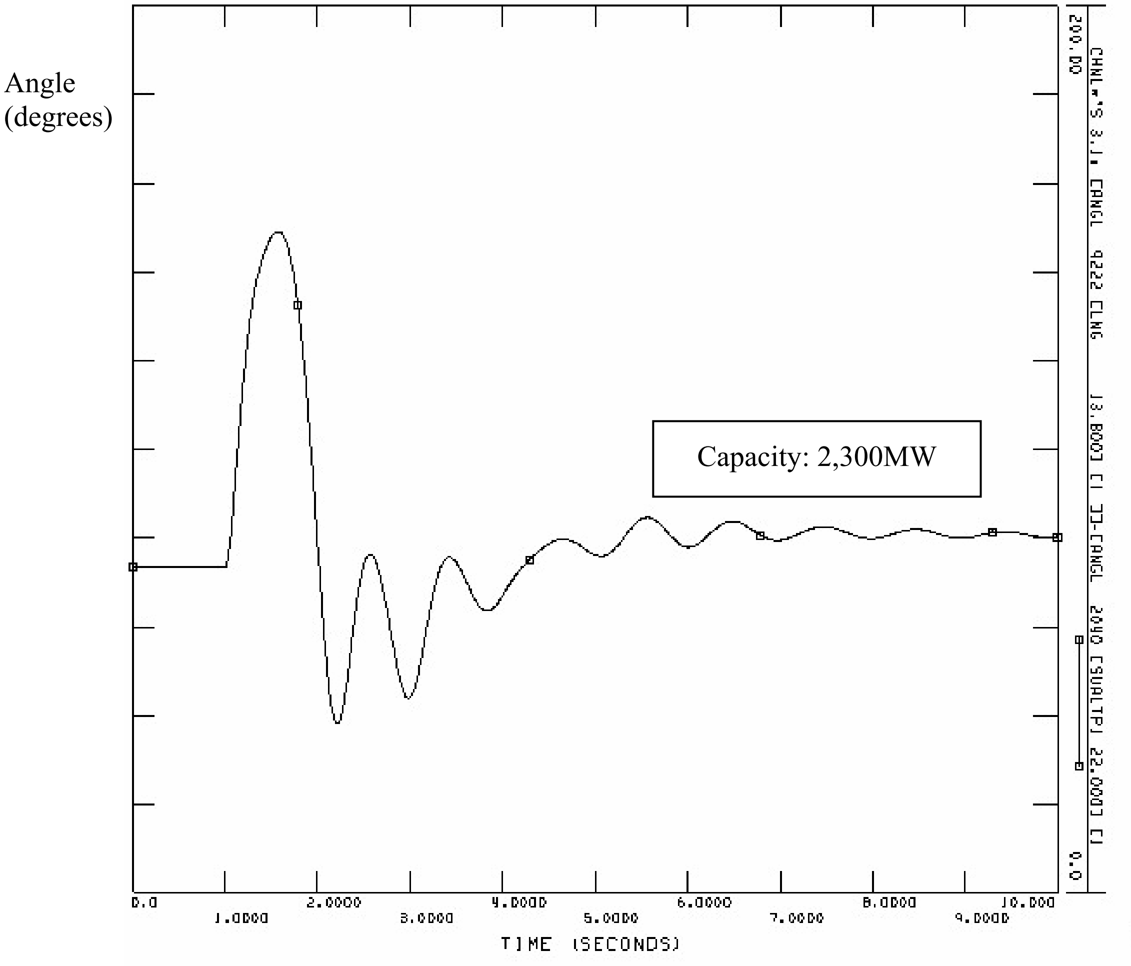


Figure 5.12 Result of Stability Analysis in Case 2

On the other hand, Table 5.11 shows the results of power flow analysis. The table below indicates that the transmission line between Ilijan power station and Alaminos switching station will be overloaded with a transmission line failure, in case that 1,500MW or more power source are developed. This means that the new 500kV Alaminos switching station has no effect to solve the overload problem of the transmission lines.

Table 5.11 Result of Power Flow Analysis in Case 2

Capacity of Power Development (MW)	In case of a failure on the transmission line between Ilijan P/S and Alaminos switching station					
	Ilijan - Alaminos		Alaminos - Dasmarinas		Alaminos - Tayabas	
1,500	103%	N.G.	33%	OK	18%	OK
2,000	122%	N.G.	36%	OK	25%	OK
2,100	126%	N.G.	36%	OK	26%	OK
2,200	130%	N.G.	37%	OK	28%	OK
2,300	133%	N.G.	38%	OK	29%	OK

Case 3 (Ilijan cut-in to Dasmarinas-Tayabas 500kV line (second circuit)

In case of Ilijan cut-in to Dasmasinas-Tayabas 500kV line (Case 3), the JICA Study Team conducted stability analysis. Figure 5.13 shows the system diagram for Case 3.

Figure 5.13 System Diagram of South Luzon(Case 3)

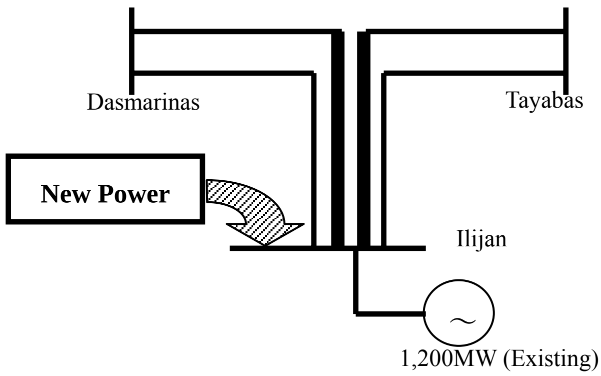


Table 5.12 and Figure 5.14 show the results of stability analysis. They indicate that the system stability is drastically improved like Case 2 in comparison with Case 1.

Table 5.12 Result of Stability Analysis in Case 3

Fault	Capacity of Power Development（MW）	Result
500kV transmission line between Ilijan P/S and Tayabas S/S（Fault terminal : Ilijan P/S）	1,500	Stable
	2,000	Stable
	2,100	Stable
	2,200	Stable
	2,300	Stable
500kV transmission line between Ilijan P/S and Dasmarinas S/S（Fault terminal : Ilijan P/S）	1,500	Stable
	2,000	Stable
	2,100	Stable
	2,200	Stable
	2,300	Stable

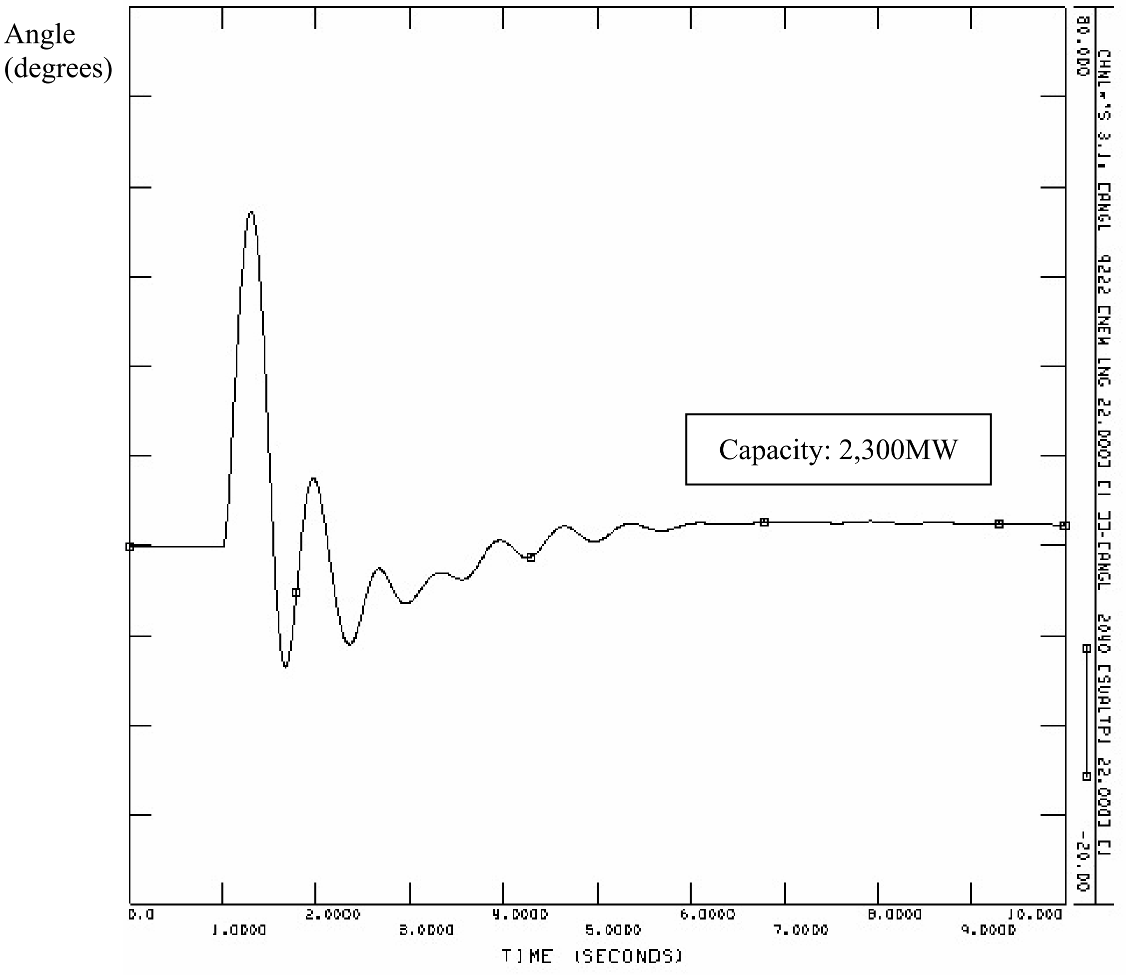


Figure 5.14 Result of Stability Analysis in Case 3

(Fault on the 500kV transmission line between Ilijan P/S and Tayabas S/S)

On the other hand, Table 5.13 shows the results of power flow analysis. This indicates that no transmission lines will be overloaded, even though a one-circuit failure occurs on the 500kV transmission lines. Thus, Ilijan cut-in to Dasmarinas-Tayabas 500kV line is an effective measure against the overload problem as well as the stability problem.

Table 5.13 Result of Power Flow Analysis in Case 3

Capacity of Power Development (MW)	In case of a failure on the transmission line between Ilijan P/S and the Dasmarinas S/S				In case of a failure on the transmission line between Ilijan P/S and Tayabas S/S			
	Ilijan - Dasmarinas		Ilijan - Tayabas		Ilijan - Dasmarinas		Ilijan - Tayabas	
1,500	52%	OK	25%	OK	33%	OK	38%	OK
2,000	58%	OK	32%	OK	37%	OK	50%	OK
2,100	59%	OK	34%	OK	37%	OK	52%	OK
2,200	60%	OK	35%	OK	38%	OK	54%	OK
2,300	61%	OK	37%	OK	39%	OK	57%	OK

Summary

Even if 1,400MW or less power sources are developed around Ilijan power station in the future, no stability problems will occur. However, stability problems would occur, if 1,500MW or more power sources are developed. In this case, the following measures are effective to improve the stability:

- Construction of the new 500kV Alaminos switching station; and
- IIlijan cut-in to Dasmarinas-Tayabas 500kV line (second circuit).

On the other hand, if 1,500MW power sources are developed, the total will be 2,700MW, considering the existing capacity at Ilijan power station is 1,200MW. In this case, the total capacity will exceed the one-circuit thermal capacity of the 500kV transmission line (4x795MCM: 2,600MVA) to Ilijan power station. Thus, if the new 500kV Alaminos switching station is adopted as a measure, an overloading will occur with a one-circuit failure of the transmission lines, and this will cause generation restriction. Meanwhile, if Ilijan cut-in to Dasmarinas-Tayabas 500kV line is adopted as a measure, no overloading will occur with a one-circuit failure of the transmission lines. Therefore, Ilijan cut-in to Dasmarinas-Tayabas 500kV line should be adopted, in case that 1,500MW or more power sources are developed around Ilijan power station in the future.

5.2 Methodology for Prioritization of Transmission Projects

5.2.1 CAPEX Reduction of TRANSCO

TRANSCO needs to apply the N-1 rule to prepare the TDP to comply with the Philippine Grid Code. However, the Philippine government currently has the policy that the CAPEX of TRANSCO should be reduced. Consequently, TRANSCO needs to defer or abandon some projects for several years. Under the circumstances, determining the priority of the transmission-line projects in the Philippines is an important issue.

Generally, deterministic methods, such as the N-1 rule, are adopted for transmission planning. The deterministic methods evaluate the effect in case that a failure (such as a single contingency or a severe contingency) occurs on any one of the facilities. Moreover, these methods are internationally adopted for transmission planning.

However, it cannot be guidance on the prioritization of projects. So, probabilistic methods, such as Loss of Load Probability (LOLP) adopted for power development planning, can also be adopted for transmission planning. However, their adoptions are limited because of the following reason: a special program is necessary; the analysis is time-consuming; and they are basically used for local systems due to technical problems in case of bulk systems.

As mentioned above, there is no standard method for prioritization, and electric utilities in the world determine the prioritization of projects with their own methodology, comprehensively considering impact of a failure, costs of construction and their policies.

Therefore, the JICA Study Team proposed the principles and the methodology to the DOE for prioritization of the projects as shown in Section 5.2.2 and 5.2.3. The DOE needs to establish its own methodology based on the proposal of JICA for evaluation of the TDP2005, reflecting the policies of the DOE.

5.2.2 Principle

For evaluation of the TDP, the JICA Study Team proposed principles for prioritization of the transmission projects to the DOE as follows:

(1) To prevent whole-system blackouts, projects to maintain the system stability (transient stability or voltage stability) should have the highest priority.

(2) A new transmission line project connecting a new power plant and the existing system should have the highest priority to transfer the generated power.

On the other hand, reinforcement of the existing system in line with the new power plants should be prioritized based on (4).

(However, a new transmission line from a new power plant to the existing system will basically be constructed by the proponent after deregulation.)

(3) Projects to maintain safety of the employees and to prevent facilities from being damaged should have higher priority.

Concretely, those projects are replacement of the circuit breakers in case of breaking-capacity shortage, measures against transient high voltage and measures to prevent capacitors from exploding by harmonics.

(4) Projects against a blackout without a contingency (in case of N-0) have higher priority than those against an N-1 contingency.

Projects of the bulk system have a big impact on the system, so they should have higher priority than projects of the local system.

In the Philippines, as loop operation is adopted for the bulk system, the amount of the overloading basically does not correspond to the amount of the blackout.

Therefore, the projects, of which corresponding overloading rate are higher, should have higher priority.

With regard to local systems operated as a radial system, the project, of which corresponding blackout is larger, should have higher priority.

Table 5.14 Voltage of Bulk System and Local System in each Grid

Grid	Bulk System		Local System	
	Transmission line	Transformer	Transmission line	Transformer
Luzon	500kV, 230kV	500/230kV	69kV	230/115kV 230/69kV
Visayas	230kV, 138kV	230/138kV	69kV	138/69kV
Mindanao	138kV (230kV)	(230/138kV)	69kV	138/69kV

Note: The voltages in parentheses are for the future.

(5) With respect to projects against an N-1 contingency, projects for bulk system have big impacts on the system, so they should have higher priority than projects for local systems.

The methodology for prioritization is the same as the one for the N-0 case.

(6) Projects with regard to power quality (e.g. voltage) have lower priority in case that they are not related to safety of the employees or damage of the facilities.

(7) With regard to the power development plan, committed projects should be considered and indicative projects should not be considered for the transmission planning.

5.2.3 Methodology for Prioritization

Table 5.15 shows the methodology proposed by the JICA Study Team to the DOE for prioritization of the transmission projects.

Table 5.15 Methodology for Prioritization

Order	Plan	Remarks
1	Plans to maintain system stability (transient stability)	SPS (Special Protection Scheme) should also be considered.
	Plans to maintain system stability (voltage stability)	The following alternatives should also be considered: new transmission lines, new power plants, transfer of generators or SVCs.
	New transmission lines for new power plants	New transmission lines connecting new power plants and the existing system. (The proponents would construct them after deregulation.) Reinforcement of the existing system should be prioritized differently.
2	Measures against short circuit problem	Split operation of the system should also be considered.
	Measures against damaging the facilities	Measures against overvoltage or harmonics.
3	Measures against overloading (N-0, Trunk system)	The order should be determined based on the rates of overloading.
4	Measures against overloading (N-0, Local system)	The order should be determined based on the amount of blackouts.
5	Measures against overloading (N-1, Trunk system)	The order should be determined based on the rates of overloading.
6	Measures against overloading (N-1, Local system)	The order should be determined based on the amount of blackouts. (In case of radial operation)
7	Measures to maintain the power quality	e.g. Measures to maintain appropriate voltage

6. Distribution Development Plan

This chapter describes the activities undertaken by the JICA Study team in assisting for the review and consolidation of the DDP. The activities are, focused on the following two themes, namely, (1) the efficient and effective collection of the DDP from DUs, and (2) maximum utilization of the DDP.

DUs are responsible for distributing electric power in their franchise area. In view of this, it is necessary to prepare the distribution-supply and demand plan based on a long-term considerations in the area. The DUs'DDPs include the supply, demand and facility expansion plans.

When the plan for power distribution - supply and demand balance is prepared, the DU should prepare the distribution-supply plan based on the demand forecast in its franchise area. However, there are potential difficulties that may be encountered since this task is new to DUs. In this regard, the JICA study team supported the DOE in DDP aggregation and analysis

6.1 Outlook of DDP

6.1.1 Legal Mandate

Pursuant to the Rule 7 Section 4 of the EPIRA IRR, distribution utilities (DUs) have a responsibility to prepare a five-year distribution development plan and submit it to the DOE by March 15th every year. Speaking in detail:

(i) ECs must submit annual DDP to NEAby the end of November. NEA will then integrates, evaluates, consolidates them as NECDDP, which is a grid extension plan prepared and to be submitted to the DOE;

(ii) Private Investors Owned Utilities (PIOUs will individually submit annual DDP to the DOE directly.

The PDC (Philippine Distribution Code 6.2.5) likewise stipulated that DUs ascertain the demand plans of important customers in the franchise area and determine the exact demand forecast. It also reiterated that a DU prepares a DDP every year and submits it to DMC (Distribution Management Committee) and the DOE.

The work flow for the DDP preparation is presented in Figure 6.1. The DOE collects all data and complete the National DDP. The consolidated DDPs then is integrated by DOE into the PDP.

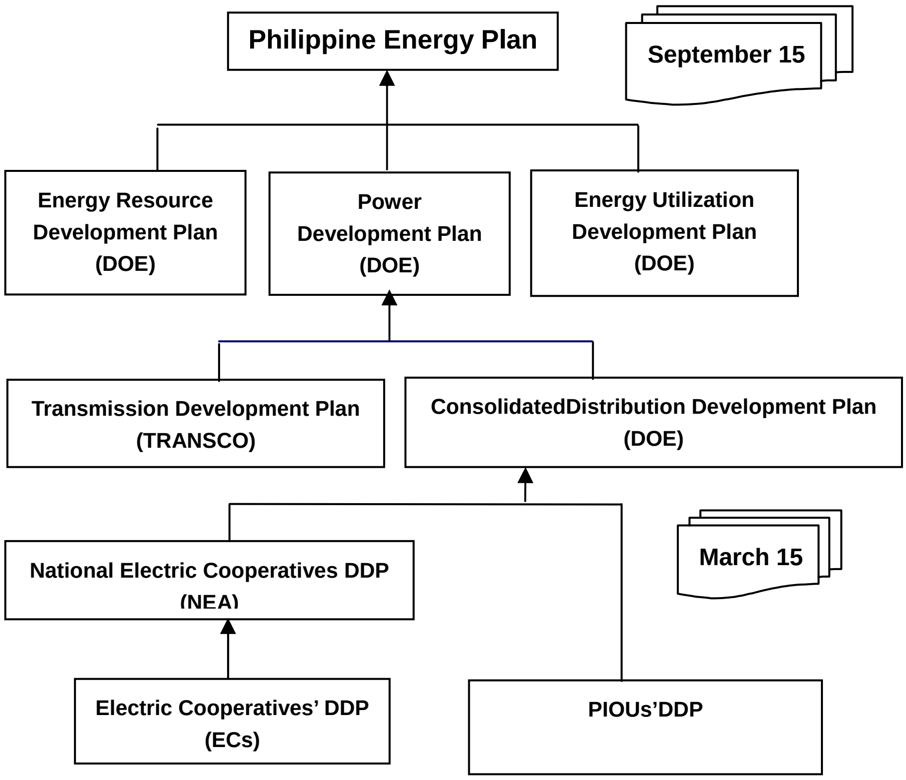


Figure 6.1 Work flow of the DDP preparation

6.1.2 The Elements of the DDP

The salient components of the DDP include the following:

- Supply and Demand forecasts;
- Sub-transmission capacity expansion;
- Distribution substation siting and sizing;
- Distribution feeder routing and sizing;
- Distribution reactive power compensation plan;
- Other distribution reinforcement plans; and
- Summary of the technical and economic analysis conducted to justify DDP.

The In the former study, the data-gathering form was established to collect wide range of data efficiently. The PDC also prescribes that a DDP should contain the following five items:

1. Demand forecast;
2. Supply facility plan;
3. Distribution development plan;

4. Critical point; and
5. Capital Plan.

Basically, each DU should prepare a five-year plan for each items. With regards to the demand forecast and supply facility plan, each DU should prepare a ten-year plan based on a long-term perspective and submit it to the DOE. The DOE aggregates them and prepares a National DDP.

6.2 Approach to DDP Submission

6.2.1 DDP Submission Flow Diagram

In 2004, the DOE ordered the DUs to prepare the DDP, submit it to the DOE twice and attend the workshop on the DDP under the cooperation with the JICA Study Team. Figure 6.2 shows the flow diagram of the DDP submission.

For the first DDP submission, the DOE wanted to make sure that each DU could submit to the DOE a properly accomplished DDP data-gathering form because DUs did not have experiences to submit the DDP. The submission rate was 92% and delayed.

The conduct of workshop on the DDP was aimed to orient and guide the DUs on proper filling up of the form in order to solve the many mistakes in the first submitted DDP. In addition, the DOE explained the purpose and the significance of DDP submission and ordered the re-submission of the DDP.

The accuracy of DDP contents and the submission rate, that is 96%, were improved with the second DDP submission. ,
With regard to the utilization of DDP, the way

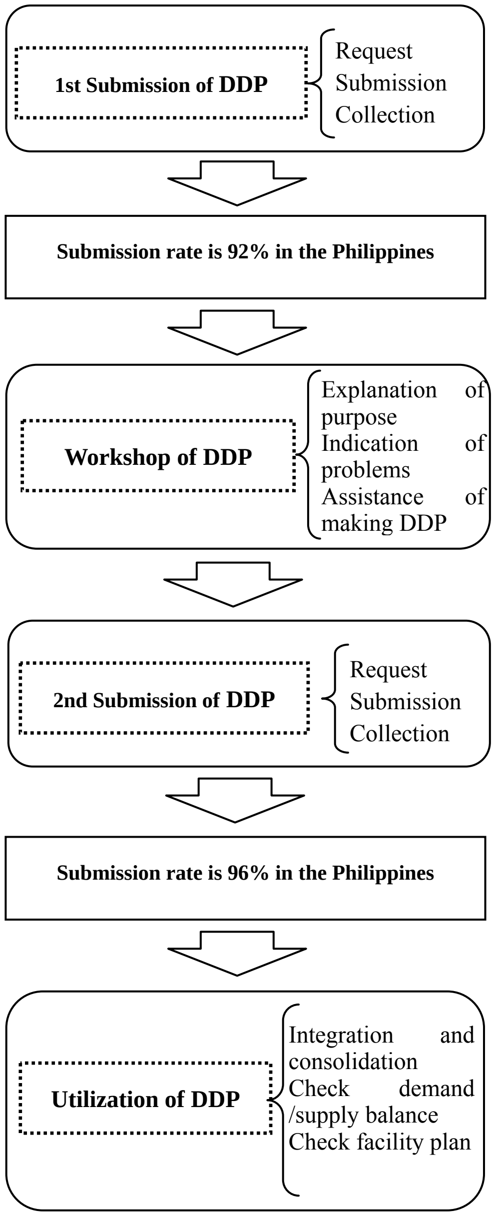


Figure 6.2 DDP submission flow diagram

to evaluate the DU's and regional supply and demand balance was proposed. In addition, the way to grasp and analyze DDP efficiently was also proposed.

The detail is described in after section 6.2.2.

6.2.2 First DDP Submission

The DOE ordered the DUs to submit the DDP in the form described in Section 6.1.1. The submission rate is shown in Table 6.1. To evaluate the submission situation, islands are divided into nine main islands and the other small islands as shown in Table 6.2. Although the rate of DDP submission is 92% for the whole Philippines, the submission rate is lower (82%) for the other small islands as shown in Table 6.2.

Table 6.1 Situation of DDP collection (Each main Island)

Island	Luzon		Mindoro	Panay		Negros	Cebu		Bohol	
EC or PIOU	EC	PIOU	EC	EC	PIOU	EC	EC	PIOU	EC	PIOU
Number of DUs submitted	41	8	2	6	0	5	4	1	2	1
Number of All DUs	44	9	2	6	1	5	4	2	2	1
Rate	**93%**	**89%**	**100%**	**100%**	**0%**	**100%**	**100%**	**50%**	**100%**	**100%**

Island	Leyte	Samar	Mindanao	
EC or PIOU	EC	EC	EC	PIOU
Number of DUs submitted	7	4	25	4
Number of All DUs	7	4	26	4
Rate	**100%**	**100%**	**96%**	**100%**

Table 6.2 Situation of DDP collection (All Philippines)

Island	Main Island		Other small Island		All Philippines		
EC or PIOU	EC	PIOU	EC	PIOU	EC	PIOU	Total
Number of DUs submitted	96	14	18	-	114	14	128
Number of All DUs	100	17	22	-	120	17	139
Rate	96%	82%	82%	-	93%	82%	92%

There are several problems, such as data mismatch, encountered in the preparation of the DDP and these are discussed below:

- Regarding the demand forecast and electrification plan, there were data inconsistencies between the latest EC Chronicle (Official record in NEA) and DDP;
- Regarding the demand forecast, supply facility plan, Distribution Development Plan and capital plan, there were missing data in the DDP;
- Regarding the Distribution Development Plan, there were data elements that do not match the Capital plan.

The factors contributing to the encountered problems in the preparation of the DDP are the following.

- Unaccustomed to the job because of the first try of DUs to prepare the DDP;
- Typical troubles on information technology (e.g. unreadable files, or the computer viruses in floppy disks);
- DUs transmit the DDP data in floppy disks due to unavailability of internet facilities in the local areas;
- Lack of sanction or punishment for non-submission of DDP as described in Section 1.3.3.

Table 6.3 Sample of the checklist

No	Electrical Utilities	Area (REGION)	File Name	Style of Documents	Contents			
					General Provision			
					1-4 info of Dus	5a-5b Brief description	6 Electrification level(Barangay)	7 Electrification level(Household)
LUZON								
1	Ilocos Norte -Dingras	Region 1	Revised DDP INEC	Electronic data	Complete	Complete	Complete	Complete
2	Ilicos Sur -Santlago	Region 1	REVISED-DDP03ISECO	Electronic data	Complete	5b is blank	Complete	Over 100%
3	La Union -Aringay	Region 1	Revised LUELCO DDP	Electronic data	Complete	Complete	Complete	Complete
4	Pangasinanl -Banl	Region 1	No data					
5	C.Pangasinan -San Carios City	Region 1	No data					
6	Pangasinanlll -Urdaneta City	Region 1	No data					
1	Batanes -Basco	Region 2						
2	Cagayanl -Solana	Region 2						
3	Cagayanll -Aparri	Region 2	revised DDPO CAGELCO2	Electronic data	Complete	Complete	Complete	Complete
4	Isabelal -Aliia	Region 2						
5	Isabelall -Ilagan	Region 2	Revised DDP-ISELCO 2-REP	Electronic data	Complete	Complete	Complete	Complete
6	Nueva Vizcaya -Dupax del sur	Region 2	DDPNUVELCO revised	Electronic data	Complete	Complete	Complete	Complete

The work of checking the DDP data is not easy because of the large volumes of data involved. A checklist was used to improve the data check efficiency. Table 6.3 shows a sample of the checklist.

In order to solve problems, such as data missing or un-submission of DDP, the DOE conducted the additional workshop as described in the Section 6.2.3.

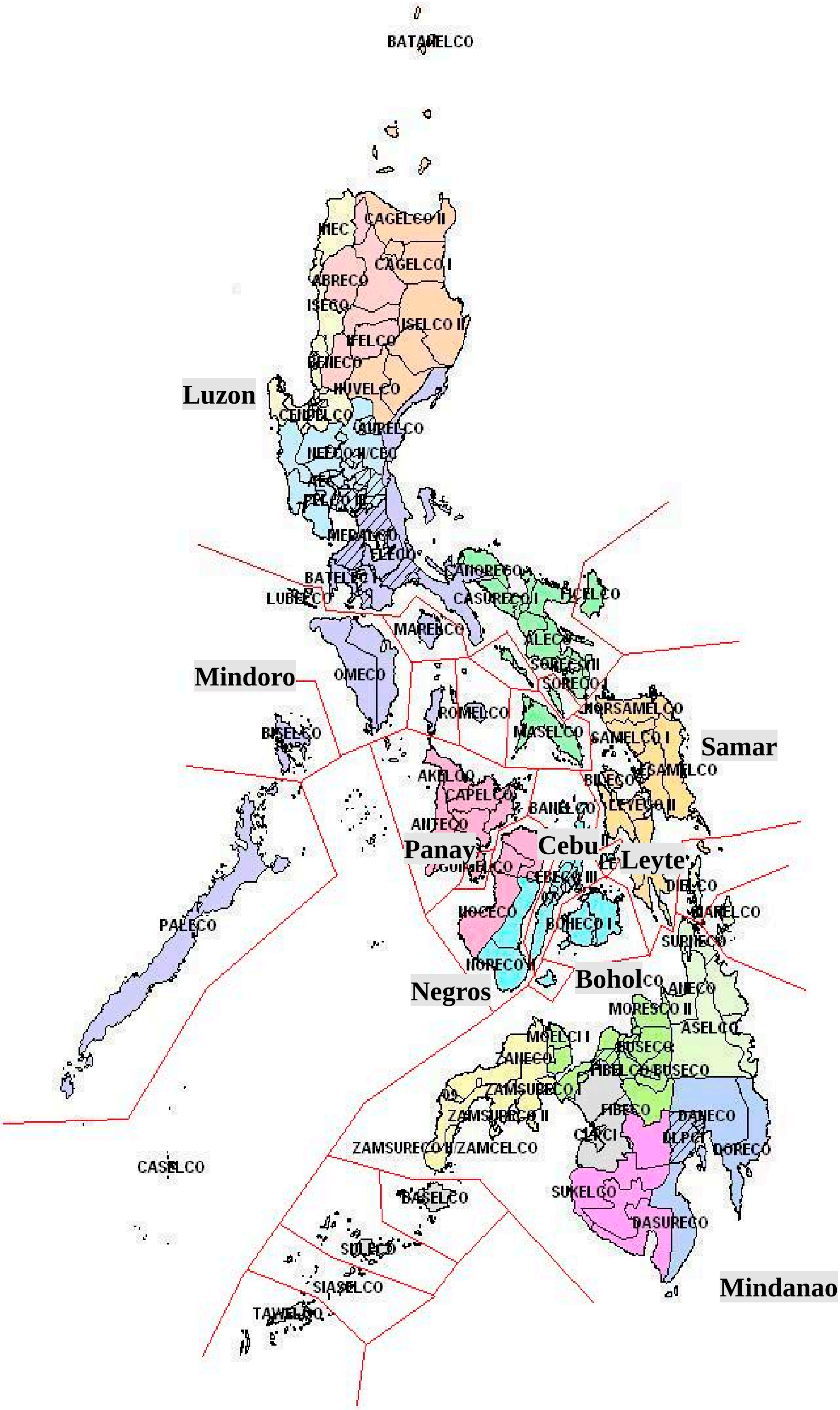


Figure 6.3 Main Islands and the Other Small Islands

6.2.3 The Regional DDP Workshops

The DOE conducted additional workshop in selected regions with the following purposes:

- To notify each DU of the objective and the significance of DDP submission;
- To improve the accuracy of DDP contents with regard to the demand, supply, distribution and other concerns;
- To orient the DUs on how to apply DDP for the determination of the infrastructure requirements that will ensure reliability of distribution and supply of power.

The schedules of the regional DDP workshops are shown in Table 6.4.

Table 6.4 Schedule of Regional DDP Workshops

Region	Date of Conduct, 2004
Davao	June
Cagayan	July
Cebu	July
Iloilo	July
Metro Manila 1	July
Metro Manila 2	July
Luzon PIOUs	August

The main topics covered in the workshop are the following:

- Power Development Plan Framework
- Salient Elements
- Legal Framework
- Pertinent DOE Issuances
- Flow of Work in the Preparation of DDP
- Information Requirements of DDP
- Methodology in Assessing the DDP

In collaboration with NEA, DOE conducted the following trials in the workshop in order to improve the quality of DDP submission:

(1) The name of the ECs that has not submitted DDP yet, or that submitted DDP but with insufficient and inadequate data;

(2)Reconciliation of data between the NEA Chronicle and the DDP;

(3)DOE instructed each ECs how to evaluate and simulate the supply and demand balance in consideration of the indicative supply in order to prepare the plan of supply and demand efficiently.

At the end of the workshop, the DOE directed the DUs to resubmit the DDPs by the next Friday after the workshop.

The workshop conducted last July 2003 that was led by the former JICA Study Team while the workshop undertaken under the follow-up study was already led by the DOE. Table 6.5 briefly shows the comparison of the conduct of the workshops.

Table 6.5 Comparison with the last workshop

DDP workshop	Main staff	The main contents
The last workshop	JICA	- Request of DDP submission - Explanation of the data gathering form -Data entry guide on the forms (example of an entry)
This workshop	DOE (NEA)	- Result of DDP submission - Explanation of the purpose and the use of DDP (example of use) - Training on preparing DDP using actual data of Supply, Demand and Facilities and so on.

The workshop was a good opportunity to learn DDP preparation for many DUs. The DOE's taking leadership in conducting the workshops and other related activities under the follow-up study demonstrates the capacity building effect.

6.2.4 Second DDP Submission

A profile of the re-submission of DDP after the workshop is shown in Table 6.6 and Table 6.7. The rate of DDP submission improved increasing the DDP submission incidence from 92% to 96%. The high rate allows the DOE to use the DDP to evaluation in each island and National Grid.

There were several improvements in the quality of the second submission of DDP and these are cited below:

- Many DUs filled in the black space on the form;.
- Wrong data inputted such as wrong unit and mismatch were improved;
- DUs rewrote the data according to the input form (Cumulative data or Yearly data).

On the other hand, there were still some problems encountered in this trial runs. For example, some DUs could still not meet the deadline for the submission, and some DDPs still have wrong data inputted and blank spaces.

It is deemed necessary for DOE to continue with the conduct of similar workshops in the next two to three years to further enhance the capability of the DUs in preparing the DDP.

Table 6.6 Situation of DDP collection (Each main Island)

Island	Luzon		Mindoro	Panay		Negros	Cebu		Bohol	
EC or PIOU	EC	PIOU	EC	EC	PIOU	EC	EC	PIOU	EC	PIOU
Number of DUs submitted	43	8	2	6	1	5	4	2	2	1
Number of All DUs	44	9	2	6	1	5	4	2	2	1
Rate	**98%**	**89%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Island	Leyte	Samar	Mindanao	
EC or PIOU	EC	EC	EC	PIOU
Number of DUs submitted	7	4	25	4
Number of All DUs	7	4	26	4
Rate	**100%**	**100%**	**96%**	**100%**

Table 6.7 Situation of DDP collection (All Philippines)

Island	Main Island		Other small Island		All Philippines		
EC or PIOU	EC	PIOU	EC	PIOU	EC	PIOU	Total
Number of DUs submitted	98	16	20	-	118	16	134
Number of All DUs	100	17	22	-	122	17	139
Rate	**98%**	**94%**	**91%**	**-**	**97%**	**94%**	**97%**

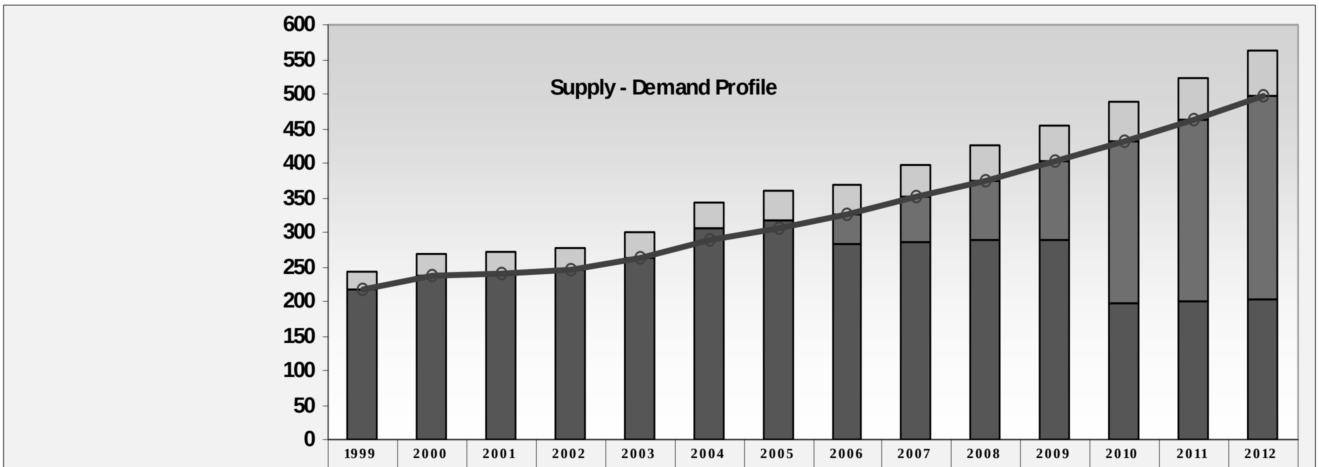
6.3 DDP Utilization

6.3.1 Supply and Demand Profile

Supply and Demand Profile

DUs are responsible for the distribution of power in their franchise area. Corollary to this, DUs must prepare a plan that will ensure reliable supply of electricity.

The DU plan will include a power supply and demand balance taking into consideration the franchise area's demand forecast. , The task of preparing the supply and demand balance was not easy since it was the first time for many DUs to undertake such activity.



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Add'l Cap to meet at least 13.2%RM	28.48	31.39	31.71	32.43	34.88	38.02	40.49	43.14	46.23	49.55	53.12	56.97	61.12	65.58
Indicative Supply (MW)	0.0	0.0	0.0	0.0	0.0	-18.2	-11.7	44.3	64.7	86.7	113.8	235.8	263.3	292.8
Firm Supply (MW)	215.78	237.79	240.23	245.70	264.28	306.23	318.45	282.52	285.48	288.66	288.63	195.79	199.76	204.04
PEAK LOAD (MW)	215.782	237.786	240.232	245.697	264.278	288.024	306.752	326.798	350.191	375.362	402.453	431.618	463.024	496.851

Figure 6.4 Sample of Supply and Demand Profile

The DOE prepared a process and templates for the DDP analysis. Using the initial submissions of the DUs, the DOE reviewed, validated and developed standard data analysis output forms and presented them in the regional workshops. Figure 6.4 shows an actual sample output by DOE.

During the DDP regional workshops, the DOE directed the DUs to prepare a summary output presentation and present the outputs on the final day of the workshop. This trial exercise was expected to achieve the following objectives:

- Each DU can double check their actual supply and demand balance; This becomes the basis for ensuring the security of supply for the future demand;
- DOE can easily aggregate the demand forecast of the island, or region to develop regional supply and demand balance. This becomes the basic data for the optimization of the PDP based on regional supply and demand balance.
- The work period is limited; only three months for preparing the demand forecast based on the macro-economy after the GDP is disclosed by NEDA in June until deadline of PDP submission to Congress, September 15th. For the demand forecast that was based on DDP

which was submitted no later than 15th of March, there are about 6 months available to prepare PDP

The sample output of the supply and demand profile as shown in Figure 6.4 provides insights such as the following:

- Growth of peak demand is slow from 2000 to 2002, the peak demand starts to grow fast from 2003;
- Enough firm supply compared to peak demand until 2005. It is necessary to introduce an indicative supply from 2006 because the demand peak exceeds the firm supply after 2006.
- It is necessary to acquire firm supply after 2010.

At the workshop, it is learned that a lot of DUs tended to secure the supply based on short-term contracts. The contract partner is mainly NPC. Even if the supply is not enough to the peak demand, the DU tends to depend on NPC to secure the supply. There are only a few DUs that are diligent in ensuring reliability of supply. There is a need to instill among the DUs of the importance of undertaking a supply and demand balance analysis.   In order to prevent a power crisis,, as that of in the situation in the Panay island, it is important for DUs to have the consciousness of the risk about insufficient supply. It is also important for the DOE to undertake macro oversight of the supply and demand balance of DUs to be able to proactively address impending problems and assist the DUs.

Summary Profiles of the DU DDPs

In order to understand the DDP data efficiently, the DOE and the JICA Study Team prepared a template for each DU's DDP summary profile called as "one-page DDP summary". The summary describes the following contents:
(1) General Information (Table 6.8)
(2) Supply-Demand Highlights (Figure 6.5)
(3) No. of Customers (Table 6.9)
(4) Level of Electrification (Table 6.10)
(5) Projected Infrastructure Requirements (Table 6.11)
(6) Capital Investment Requirements (Table 6.12)

Figure 6.5 shows the sample of a one-page DDP summary profile allowing easy and quick characterization of the DU's operations and plans. Also, the data and information contained in the DDP can be useful to the investors to gauge potential business or investment opportunities with the DUs.analyze the DU because the number of customers and a distribution development plan are also described in DDP.

Table 6.8 General Information

General Information	
Address	
Contact Person	
Position	
Tel. No:	
Fax No:	
E-mail Address	
Franchise Area	775 sq. kms.
Franchise Coverage	Our franchise area covers the whole city of Iligan, part of Lanao del Norte province located in the northwestern part of Mindanao, comprising of fourty-four (44) barangays

Supply-Demand Highlights

- Provide the methodology and assumptions used in load forecasting
- Cite whether there are indicative plans for commercial and industrial sectors

Figure 6.5 Supply-Demand Highlights

Table 6.9 No. of Customers

No. of Customers	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Residential	33,863	34,864	35,895	36,956	38,048	39,173	40,331	41,523	42,751	44,015
Commercial	6,021	4,756	3,757	2,968	2,345	1,852	1,463	1,156	913	721
Industrial	14	14	17	17	17	17	17	17	17	17
Others	475	484	490	495	500	505	510	515	520	525
Total	**42,377**	**40,119**	**40,159**	**40,436**	**40,910**	**41,547**	**42,321**	**43,211**	**44,201**	**45,278**

Table 6.10 Level of Electrification

Level of Electrification	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Barangay Level (%)	89%	91%	93%	95%	98%	100%	100%	100%	100%	1
No. of Barangays Energized (On-Grid)	39	40	40	40	40	40	40	40	40	40
No. of Barangays Energized (Off-Grid)	-	-	1	2	3	4	4	4	4	4
Total	**39**	**40**	**41**	**42**	**43**	**44**	**44**	**44**	**44**	**44**
Household Level (%)										
No. of Household Energizzed (On-Grid)	33,863	34,864	35,895	36,956	38,048	39,173	40,331	41,523	42,751	44,015
No. of Household Energizzed (Off-Grid)	-	-	114	319	400	474	488	503	518	533
Total	**33,863**	**34,864**	**36,009**	**37,275**	**38,448**	**39,647**	**40,819**	**42,026**	**43,268**	**44,548**

Table 6.11 Projected Infrastructure Requirements

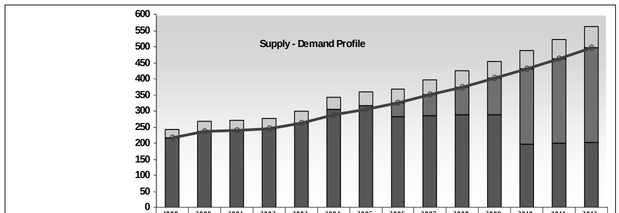
Projected Infrastructure Requirements	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Distribution/Sub-transmission Facilities		1,673.70	1,715.91	1,722.13	1,764.23	1,811.10	1,863.09	1,920.62	1,984.23	2,054.51
Expansion	319	358	400	406	448	495	547	605	668	739
Rehabilitation/Upgrading	1316	1316	1316	1316	1316	1316	1316	1316	1316	1316
Substation Capacity (MVA) Expansion	82	82	82	82	82	82	82	82	82	82
Substation Capacity (MVA) Retirement		10	10	30	-	-	-	-	-	-
Reactive Power Compensation Plan (KVAr)	8,250	9,450	9,450	9,450	10,650	10,650	10,650	10,650		

Table 6.12 Capital Investment Requirements

Capital Investment Requirements (in Million PhP)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Distribution/Subtransmission Facilities	64.50	183.24	154.88	242.60	85.14	93.77	94.03	165.85	174.88	181.22
Expansion	35.46	155.33	69.65	68.42	59.64	78.91	77.69	87.87	95.11	99.47
Rehabilitation/Upgrading										
Substation Capacity	29.04	27.91	85.23	174.18	25.50	14.86	16.34	77.97	79.77	81.75
Electrification Projects	50.24	43.00	209.30	52.03	57.24	62.96	69.26	76.18	83.80	92.18
Total	**179.25**	**409.49**	**519.06**	**537.23**	**227.52**	**250.49**	**257.32**	**407.87**	**433.56**	**454.62**

ELECTRIC COOPERATIVE A

General Information	
Address	
Contact Person	
Position	
Tel. No:	
Fax No:	
E-mail Address	
Franchise Area	775 sq. kms.
Franchise Coverage	Our franchise area covers the whole city of Iligan, part of Lanao del Norte province located in the northwestern part of Mindanao, comprising of fourty-four (44) barangays



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Add'l Cap to meet at least 13.2%RM	28.48	31.39	31.71	32.43	34.88	38.02	40.49	43.14	46.23	49.55	53.12	56.97	61.12	65.58
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Firm Supply (MW)	215.78	237.79	240.23	245.70	264.28	306.23	318.45	282.52	285.48	288.66	288.63	195.79	199.76	204.04
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Firm Supply -reported power supply in the DDP covered by contract or commitment to be available at all times.
Indicative Supply – ***Historical***- unaccounted supply source but was delivered and most probably from NPC Plants.
- ***Projected***- power supply needed to meet the demand

Supply-Demand Highlights

- Provide the methodology and assumptions used in load forecasting
- Cite whether there are indicative plans for commercial and industrial sectors

No. of Customers	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Residential	33,863	34,864	35,895	36,956	38,048	39,173	40,331	41,523	42,751	44,015
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Industrial	14	14	17	17	17	17	17	17	17	17
Others	475	484	490	495	500	505	510	515	520	525
Total	**42,377**	**40,119**	**40,159**	**40,436**	**40,910**	**41,547**	**42,321**	**43,211**	**44,201**	**45,278**

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No. of Barangays Energized (On-Grid)	39	40	40	40	40	40	40	40	40	40
No. of Barangays Energized (Off-Grid)	-	-	1	2	3	4	4	4	4	4
Total	**39**	**40**	**41**	**42**	**43**	**44**	**44**	**44**	**44**	**44**
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Total	**33,863**	**34,864**	**36,009**	**37,275**	**38,448**	**39,647**	**40,819**	**42,026**	**43,268**	**44,548**

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Substation Capacity (MVA) Expansion	82	82	82	82	82	82	82	82	82	82
Substation Capacity (MVA) Retirement		10	10	30	-	-	-	-	-	-
Reactive Power Compensation Plan (KVAr)	8,250	9,450	9,450	9,450	10,650	10,650	10,650	10,650		

Capital Investment Requirements (in Million PhP)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
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Total	**179.25**	**409.49**	**519.06**	**537.23**	**227.52**	**250.49**	**257.32**	**407.87**	**433.56**	**454.62**

Figure 6.6 Sample of one-page DDP Summary

6.3.2 Regional Supply and Demand Balance

The JICA Study Team proposed that the supply and demand balance provided in the DDP should be evaluated to gain insights on the security of supply.

Evaluation of the regional supply and demand balance was proposed in Table 6.13. Figure 6.7 shows the geographic locations of the regions.

At the beginning of this study, DOE requested to divide Luzon and Mindanao area into several sub-regions. Also, the sub-regional demand forecast has been considered in the PDP.

With regard to PDP, the DOE also requested the JICA Study Team to take the area division into consideration to some degree. However, in the Luzon and Mindanao area, loop operation is used in the system. Also, there is the different voltage level in the loop Therefore, it is very difficult to figure out the limit without detailed analysis to the whole electric power system.

The JICA Study Team decided not to complement the detailed analysis because the effect is not so much compared with the level of effort required by the analysis.

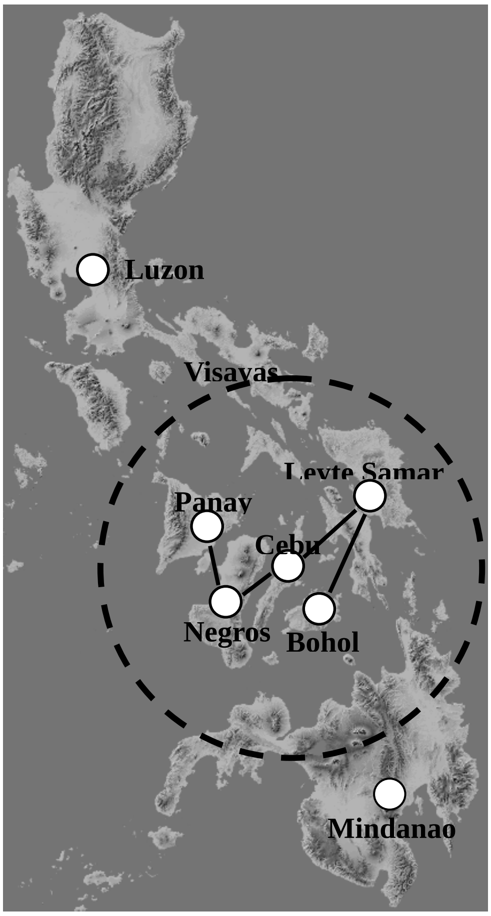


Figure 6.7 Geographic locations of the regions

Table 6.13 Hierarchized of areal supply and demand balance

	Demand	Supply	Power Plant
Philippine	Total of DUs demand forecast	Total of DUs firm supply	Total of Power Plant (include and exclude indicative)
Area Luzon,Visayas,Mindanao	Total of DUs demand forecast in area	Total of DUs firm supply in area	Total of Power Plant in area (include and exclude indicative)
Island Cebu,Negros,Panay,Bohol, Leyte-Samar	Total of DUs demand forecast in island	Total of DUs firm supply in island	Total of Power Plant in island (include and exclude indicative)

Table 6.14 shows power balance between supply and demand. The supply and peak demand was described using the information from the first and second submission of the DDP and presented by the regional division as shown in Table 6.9.

Table 6.14 Example of supply and demand balance from submitted DDP

Demand / Supply balance from DDP in Luzon

EC or PIOU	DU name	Region	Source	data	Name	Contents	unit	1998	1999	2000
EC	INEC	Region 1	1st Submission	Supply data	?(Blank)	Installed Capacity	KW	2,000	2,000	2,000
						Net Dependable Capacity	KW	1,600	1,600	1,600
					Supply from NPC	Contracted Demand	KW	24,050	25,350	26,650
					Supply from NPC's Transition Supply Contract	Contracted Demand	KW	6,000	6,000	6,000
					Supply Total	Contracted Demand	KW	31,650	32,950	34,250
				Demand data	Peak Demand		KW	24,785	26,522	28,741
				balance data	balance		KW	6,865	6,428	5,509
EC	ISECO	Region 1	1st Submission	Supply data	Supply from NPC	Contracted Demand	KW	17,667	18,800	19,800
					Supply Total	Contracted Demand	KW	17,667	18,800	19,800
				Demand data	Peak Demand		KW	22,623	23,531	25,423
				balance data	balance		KW	-4,956	-4,731	-5,623
EC	LUELCO	Region 1	2nd Submission	Supply data	Amburayan Mini-Hydro Plant	Installed Capacity	KW			
						Net Dependable Capacity	KW	160	160	180
					Supply from NPC	Contracted Demand	KW	17,392	17,392	18,150
					Supply from NPC's Transition Supply Contract	Contracted Demand	KW			
					Supply Total	Contracted Demand	KW	17,552	17,552	18,330
				Demand data	Peak Demand		KW	17,683	18,104	20,123
				balance data	balance		KW	-131	-552	-1,793
EC	PANELCO	Region 1	No DDP							
EC	CENPELCO	Region 1	No DDP							
EC	PANELCO 3	Region 1	2nd Submission	Supply data	Supply from NPC's Transition Supply Contract	Contracted Demand	KW	11,000	11,000	11,000
					Supply Total	Contracted Demand	KW	11,000	11,000	11,000
				Demand data	Peak Demand		KW	29,022	29,106	31,971
				balance data	balance		KW	-18,022	-18,106	-20,971
PIOU	DECORP (Dagupan Electric Corporation)	Region 1	1st Submission	Supply data	Supply from NPC	Contracted Demand	KW			
					Supply Total	Contracted Demand	KW	0	0	0
				Demand data	Peak Demand		KW		29,365	35,273
				balance data	balance		KW	0	-29,365	-35,273

From a short-term point of view, the difference between supply and demand is little because DUs have already contracted the power purchase agreement on the electric power supply. On the other hand, from a long-term point of view, the difference between supply and demand is large because DUs do not have the long-term power purchase agreement. Actually, DUs' firm power supply is not enough for the forecasted peak demand in short term.

Table 6.14 shows an actual peak demand and forecasted demand taken from the data in DDP. DUs , buys electric energy from the TRANSCO in substations in their franchise area. Total of DUs and large customers'demand in the target area differs from the demand of one of the whole system that is used for demand forecasting and PDP which is measured at the generator end (gross generation). Therefore, it is necessary to compensate the system loss between the net demand and gross demand. A system loss consists of (1) energy consumption for power station own use, (2) transmission loss. Moreover, the peak demands of all DUs do not occur at the same time.

The total of the peak demand of all DUs differs from the one of the whole system because the peak demands of all DUs do not occur at the same time. This also causes the difference between the aggregated demand peak and the system demand peak in the target area, which is used for PDP since last year.

There is a need to adjust the factor one by one. However, it is difficult to show the value for each each factor individually. To estimate the peak demand of the whole system by DDP aggregation, the adjustment coefficient was assumed to be the correction factor and was calculated as follows;

$$Correction\ factor = \sum \frac{(Power\ generatation\ in\ the\ power\ plants)}{(Peak\ demand\ in\ DUs\ and\ Large\ customers)} \quad (6{\cdot}1)$$

*All data were measured through TRANSCO system operator, in 2003

$$Forecasted\ peak\ demand = Correction\ factor \times Forecasted\ peak\ demand\ by\ DDP\ aggregation \quad (6{\cdot}2)$$

The power crisis that occurs in the Panay island can be forecasted through the regional supply and demand analysis as shown in Figure 6.8. For example, it is necessary to secure enough supply when the supply from outside of area is limited by transmission capacity. When a construction period of the power plant, which include lead time until construction, is assumed to be five years, there is a possibility of power crisis if the power supply after five years will not satisfy a forecasted peak demand.

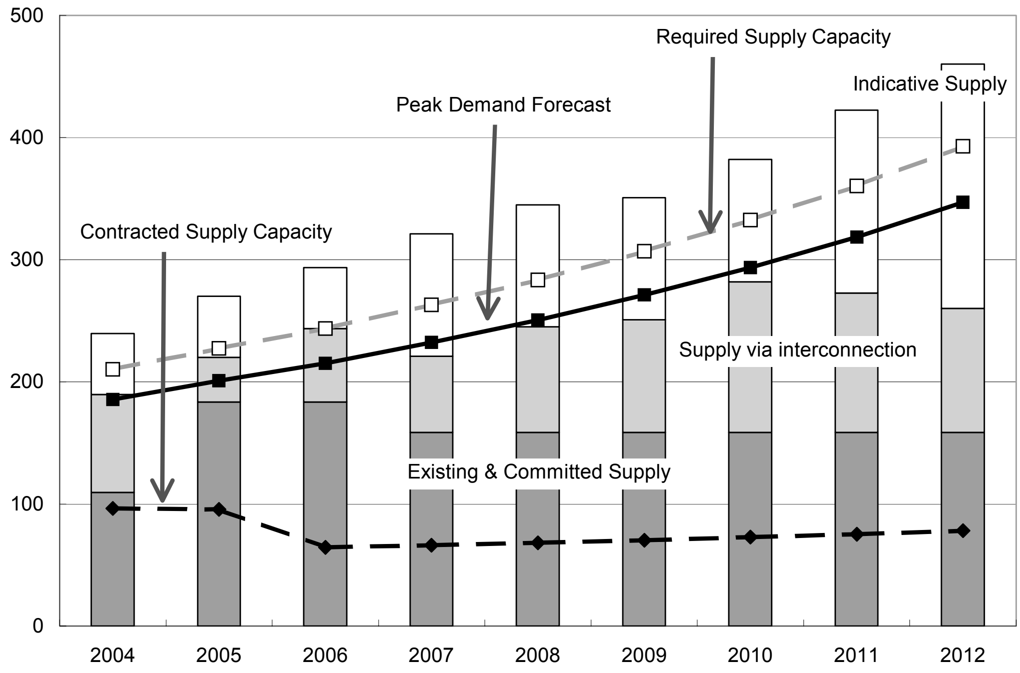


Figure 6.8 Supply and demand balance at Panay island

* The power development plan in the Philippines is prepared to satisfy certain LOLP value (LOLP=1day/year). However, figure 6.8 assumes that generation reserve margin is constant.

As shown in Figure 6.8, in 2004, the contracted supply capacity is one - third of the forecasted peak demand .

There is a big difference on the individual DU's capability to prepare the DDP and seemingly the size classification of the DU is a factor. The large-scale DU has the capability to prepare the DDP. On the other hand, the small-scale DU needs support in preparing the DDP.

A DU presented in the workshop that the electric energy supply in their franchise area is almost similar to the peak demand forecast. When they were asked about their consideration about the supply of power, they optimistically explained that NPC will supply enough power in the future just like the present. A DDP based on this optimistic forecast , it will be impossible to evaluate the proper supply and demand balance in the area. This presents the necessity for a continuing guidance in the preparation of the DDP.

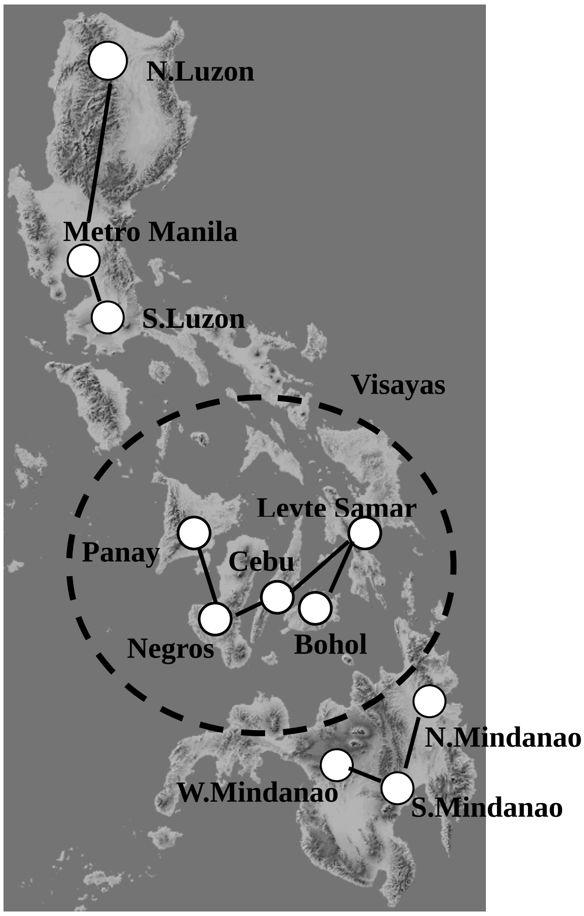


Figure 6.9 Geographic locations of the regions

6.3.3 DDP as a basis of Power Development Plan

PDP of the Philippine is prepared for Luzon, Visayas and Mindanao area. From the viewpoint of the power development plan, followings are achieved by use of DDP;
(1) Evaluation of Optimal Siting of power Plants
(2) Data Gatering Tool for the PDP

(1) Evaluation of Optimal Siting of power Plants

In PDP2003, the optimal siting of power plants in Visayas was determined by using WSAP-IV and operation cost analysis with consideration of power flow by calculating the GTMax.

By comparing the above supply demand balance with the DDP, regional supply - demand balance and optimal location can be evaluated more precisely in future. Regarding the demand in the previous PDP,, demand forecast in divided area was made by using the regional economic index, information from NEA and TRANSCO. However, in future, the peak demand forecast in each area with further sub-division or contracts of new customer can be made possible by using the DDP. Therefore, the DDP is considered as a very important subordinate program in order to gather and evaluate the fundamental data of the PDP.

As mentioned earlier, the DOE requested the JICA Study Team to take the area division into consideration to determine the optimal location. However, in contrast with the simple visayas system, loop operation is adopted in the Luzon and Mindanao system. Also, there is the different voltage level in the loop Considering this, the JICA Study Team decided not to complement the detailed analysis because the effect is not so much compared with the level of effort required by the analysis.

On the other hand, If a new power plant is introduced in the northern or southern part of Luzon, another transmission line or substations would be required to convey electric energy to Metro Manila, the largest load center in Luzon. Therefore, DOE wants to induce the power development to the center of Luzon area in order to reduce the investment in the new transmission facility. A sub-regional power development planning maybe necessary depending on the progress of power development. In this case DDP can be fully used for this study.

(2) Data Gathering Tool for the PDP

In PDP 2003, the number of embedded generator was estimated from TRANSCO's information to discount PDP, because it was difficult to gather actual capacity. . In PDP 2004, the number of embedded generators is collected from the DDP submission from DUs. In order to check the embedded generators, the following items are added to the DDP form:

- Self – Generation/ Production Facilities
- Supply from other sources

These information was summarized in the DDP and showed in Table 6.15. It is difficult to analyze and evaluate the DDP submission, which contains large amount of information, using Excel with limited resources of DOE every year. So, the PDP data management system, which is discussed in chapter 7, has a capability of data gathering and analyzing this time.. As a result, it will become easier to gather and evaluate DDP next year.

An indicative plant which is required in the distant future (with enough time for construction period) can be considered as a signal for the investor to join the electric power market. However, an indicative plant which is required in the near future (not enough time for construction period) must be considered as a signal for an impending crisis.

Table 6.15 An example of list of power plant

No	DU's		Area (REGION)	Area (Island)	Plant name	
					Owned Production Facilities (15a)	Supply from other sources (15B)
VISAYAS						
EC	Aklan -Kalibo	AKELCO	Region 6	PANAY		
EC	Antique -SanJose	ANTELCO	Region 6	PANAY		
EC	Capiz -Panltan	CAPELCO	Region 6	PANAY		
EC	Iloilol -Tigbauan	ILECO 1	Region 6	PANAY		IPP1 MIRANT
EC	Iloiloll -Pototan	ILECO 2	Region 6	PANAY		
EC	Iloilolll -Sara	ILECO 3	Region 6	PANAY		
PIOU	Panay Electric Company	PECO	Region 6	PANAY	English Electric Vulcan IH 103	PPC-1
					English Electric Vulcan IH 107	MIRANT(AVON)
					Mirrless Blackstone 16KV Major	MIRANT 2(AVON 2)
					IHI Pielstick 16 PC-2V	
					Worthington S E H	
EC	Guiaras -Jordan	GUIMELCO	Region 6	Other Small Island		
EC	V-M-C Rural -Manapla	VRESCO	Region 6	NEGROS	Sipaway Generating Set	

6.4 Incorporating DDP data into PDP Data Management System

It is an effective method to summarize DDP profile in order to grasp the DUs' characteristic as described in Section 6.3. The DOE intends to make the summary profile for each of the DU every year.

As the result of discussion with the DOE, the responsibility of preparing the DU summary profile can be done automatically by using the submitted DDP as input and developed as one function of PDP Data Management System.

6.4.1 Output from DDP

JICA and the DOE decided to apply the summary form which the DOE uses in their work to the summary form in PDP Data Management System. However, only this summary is not the quantitative and efficient method by itself to grasp and analyze the correlation relationship among a demand forecast, a distribution facilities development plan, capital plan and the comparison among the same-scale DUs.

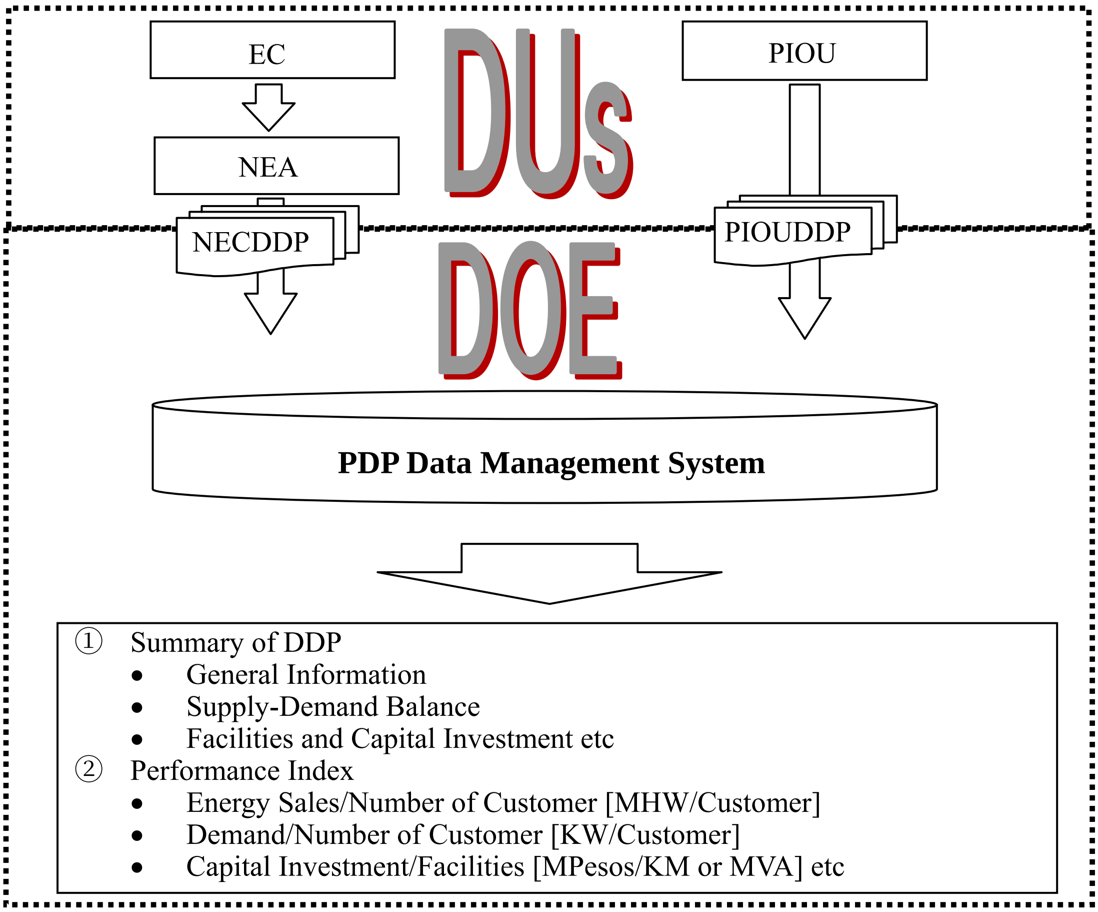


Figure 6.10 The dataflow of DDP and Output image from PDP Data Management System

In order to understand and analyze the relationship , Performance Index of each DU was developed as one function in PDP Data Management System. The detail is described in Section 6.4.2. Figure 6.10 shows the DDP dataflow and output overview of PDP Data Management System.

6.4.2 Performance Index

6.4.2.1 Contents of Performance Index

For the purpose of understanding and analyzing the correlation quantitatively and accurately, , Performance Index is composed of the following elements:

(i) To validate further the consistency of projected energy/demand forecast

- ✓ Energy Sales / Number of Customer
- ✓ Demand / Number of Customer

(These contents are prepared by each type of Customer)

(ii) To determine the reasonableness of the network expansion plan with their corresponding investment cost

- ✓ System Peak Demand / Aggregate Substation Capacity

(Utilization Performance)

(iii) Asset Efficiency

- ✓ Total Investment Cost / Total Customer
- ✓ Total Investment Cost / Total Energy Sales

(iv) Facilities Direct Cost

- ✓ Capital Investment / Total ckt-km
- ✓ Capital Investment / Total MVA
- ✓ Capital Investment / Total KVAR

The use of these indexes every year is useful in order to check the balance between the demand forecast and the distribution facilities development plan, and to check the balance between the distribution facilities development plan and the capital investment on each DU.. Table 6.16 shows a sample of Performance Index

Table 6.16 A sample of Performance Index

Performance Index

Forecast/Planning Results	Units	Historical							
		1999	2000	2001	2002	2003	average	2004	2005
①Sales/No of customers									
Residential	MHW/Custmr	1.34	1.38	1.44	1.49	1.57	1.44	1.57	1.59
Commercial	MHW/Custmr	10.4	11.1	11.2	11.2	12.4	11.27	12.2	11.4
Industrial	MHW/Custmr	1,008	959	964	1,102	1,163	1,039	1,169	1,176
Others	MHW/Custmr	132	162	213	254	340	220	440	438
TOTAL Customer Sales	MHW/Custmr	3.15	3.21	3.35	3.51	3.66	3.37	3.82	3.84
②Peak Demand/No of customers									
Residential	KW/Custmr	0.25	0.25	0.26	0.30	0.32	0.28	0.32	0.33
Commercial	KW/Custmr	1.92	2.01	2.02	2.06	2.56	2.11	2.52	2.36
Industrial	KW/Custmr	183	174	175	189	203	185	202	201
Others	KW/Custmr	25.4	29.8	39.6	44.3	57.6	39.3	61.3	60.4
TOTAL Customer demand	KW/Custmr	0.59	0.59	0.61	0.65	0.70	0.63	0.69	0.70

6.4.2.2 Comparison of DUs by Performance Index

The DDP data of only one DU can not make it possible to evaluate whether the data in the DDP are valid numbers or not. Then, in order to check the DDP data, it is necessary to make the approach to the DDP at macro-level analysis. For example, it is useful to check whether the capital investment to meet the peak demand power is reasonable and whether the demand growth is reasonable compared with the growth of customers number. As the result of discussion with the DOE, the DOE tried to analyze the data by reviewing the historical five years average values of the main Performance Index items. It is important to compare between same-class DUs (e.g. same regional characteristics, same demand density and same growth rate). In this study, the NEA's classification to each EC is applied to the default classification.

Table 6.17 and Figure 6.11 show the comparison sample by use of the Performance Index. From now on, the following three processes are deemed important:

- To accumulate the data of the Performance Index continuously;
- To classify DUs originally based on the DOE's decision by use of the accumulated data;
- To evaluate each DDP by comparing the Performance Index.

Table 6.17 A sample of Performance Index

No		Classification	Average of Histrical 5 years Residential (SAMPLE DATA) (Sales/No of customers)	Residential (SAMPLE DATA) (Demad/No of customers)
1	INEC	A+	3.690437305	0.195014509
2	ISECO	A+	1.997009857	0.153196205
3	LUELCO	A+	2.800217939	0.092760159
4	PANELCO 1	Deferred	0.161280783	0.050350577
5	CENPELCO	E	0.149893804	0.04584704
6	PANELCO 3	Deferred	0.318371787	0.066610879
1	BATENELCO	A+	2.869029995	0.238273881
2	CAGELCO 1	A+	2.627717381	0.140620341
3	CAGELCO 2	B	2.274432465	0.085203951
4	ISELCO 1	C	1.963426518	0.090831105
5	ISELCO 2	D	0.940644021	0.10511662
6	NUVELCO	A+	4.439626421	0.153156711
7	QUIRELCO	B	2.464070915	0.20488911
1	AURECO	A+	2.586130027	0.018785299
2	TARELCO 1	A+	1.056565471	0.043255901
3	TARELCO 2	A+	4.009265852	0.119034519
4	NEECO 1	Deferred	0.276258105	0.090844234
5	NEECO 2	E	0.342173355	0.234055703

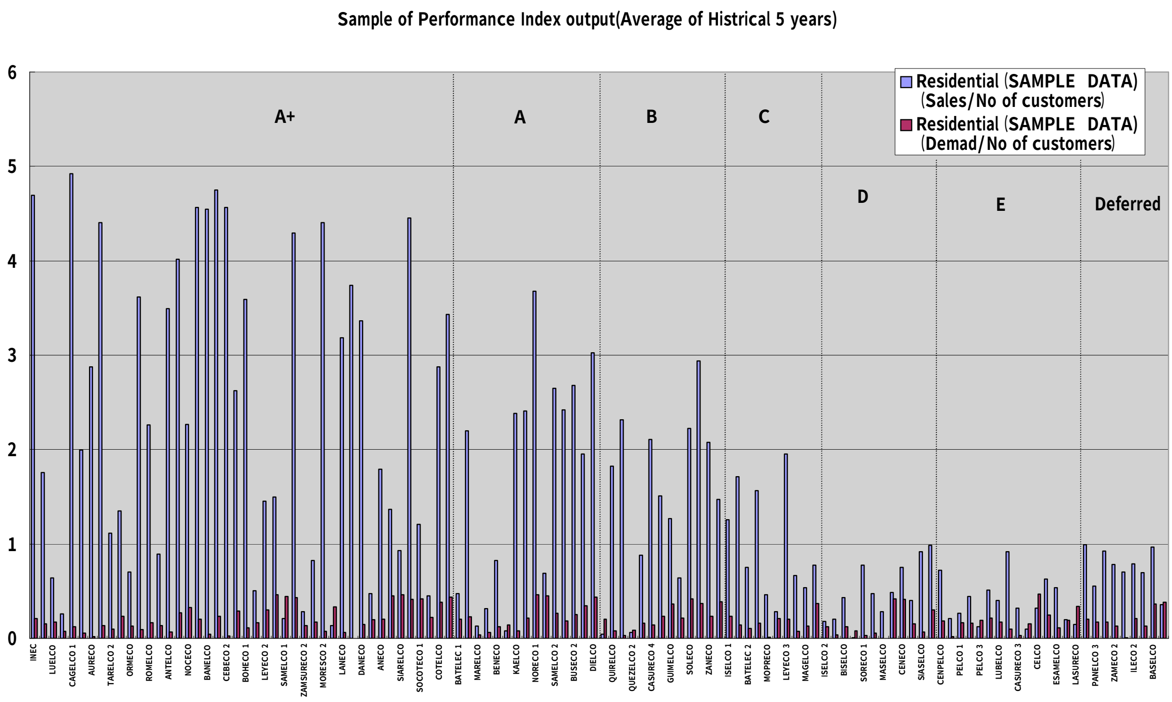


Figure 6.11 A sample graph of the comparison with Performance Index

7. PDP Data Management System

7.1 Objective of PDP Management System

To date, the DOE has been gathering PDP related data by paper, FAX media. Moreover, these data and information are being manually encoded into their system and have been processing the data.

There are potential problems with the current practice of the DOE and these include the following:

- it takes time to gather data;
- there might be some manual errors;
- it takes time to analyse data; and
- the result might be inaccurate

The DOE officials have recognized these concerns, and have requested the development of a seamless system to support PDP data gathering and analysis.

The PDP Data Management System consists of two different applications:

- PDP system
- TDP system

The PDP system supports the PDP and DDP data gathering format generation, report generation, search and sort data function, data export/import function and the administration function. The TDP system, on the other hand, is a simple application which analyzes the difference between two compararive sets of data of the same - format.

The purpose of the two systems is to make a seamless workflow system that covers data gathering, data analysis and the result reporting, based upon the DOE request which aims to improve the accuracy and reduce the time consumed for PDP preparation and TDP – DDP review and/or approval.

7.2 Overview of the PDP Management System

7.2.1 Elements of the PDP Management System

The PDP System

The scope of the PDP system shall be as follows:

- PDP data gathering format generation;

- PDP data search and reporting; and
- Administration function

The PDP data management system covers not only PDP data but also covers DDP data. This application has several functions that are described below:

(i) Data gathering. The data entry forms consist of Profile, Monthly form and Annual form for PDP and DDP. The Profile form covers the profile of power company for PDP, and of EC for the DDP. The DOE will gather data on a monthly and annual basis. To generate monthly data, the DOE can specify the power company name and exact month/year for PDP data. The data gathering form which will be generated automatically covers the blank form for the power company to accomplish, and also covers the previous months (or years) data which the power company filled up and submitted to the DOE. The form covers the previous data to help them with their data entry operation and avoid possible input error. There are some identifiers for the ECs and the power company that are embedded and hidden in the Excel form generated, and the identifiers could assist this application when the data is imported to insert/update the exact data.

(ii) PDP reporting. The DOE staffs currently prepare various reports manually and it's a time and labor consuming task. and it might be prone to manual operations' errors. This function will assist the DOE staff to prepare reports efficiently, accurately and on time. This function covers the following typical reports:

For the PDP

- List of existing plants for a specified year;
- List of Power statistic report for a specified year;
- List of Installed capacity report for a specified year;
- Dependable capacity report for annual, semi-annual, quarterly, and monthly;
- Power generation report for annual, semi-annual, quarterly, and monthly.

For the DDP

- Annual summary report for each EC;
- Performance index summary report, and specific report for each EC;
- Monthly operation report for each EC.

(iii) Search. After large volume of data are recorded, a user might have trouble searching for the specific data. A user might also need to sort data based on certain requirements and/or parameters such as the capacity, generation, the number of customers, etc. The search function was not requested by the DOE, however based on past experiences of the JICA Study Team, the later recognizes that the search function is one of the crucial functions for the DOE in the long run. The DOE could perform search function from following point of views;

For the PDP

- By location choice from Luzon, Visayas, Mindanao, and all;
- By grid choice from each Grid;
- By regional choice from 14 regions;
- By plant type, Diesel,turbine, geothermal, etc;
- By fuel type, Diesel, Bunker C, Geothermal, Natural gas
- By plant name

The DOE can identify either specific data or two different data for two data comparison; for example, DOE can get a sorted PDP list which has the biggest generation during the specified period, by the power generation amount order. Data can be sorted by Installed capacity, Dependable capacity and Generation.

For the DDP

- By location choice from Luzon, Visayas, Mindanao, and all
- By grid choice from each Grid
- By regional choice from fourteen regions
- By utility type, EC or private
- By utility name

As in the PDP, the DOE can identify either specific data or two different data for two data comparison; for example, DOE can get a sorted EC list which has the biggest sales during the specified period, by the power sales amount order. Data can be sorted by Number of customers, Number of Barangays energized, System loss, Direct sales to customers, Electricity Purchased, Electricity Generated, and total supply.

(iv) Import/Export. The import function is required when the DOE imports the data which are submitted by power generation companies and ECs. The DOE is required to check the form and value of submitted data before it is imported. This function is coupled with the export function which could transform registered data into CSV format compliany to other analysis tools, GTMax and WASP-IV.

(v) Link to TDP directory. There is a link icon, "Open TDP Directory", to easily move to TDP directory. One needs to settle the exact path on the administration tab before the function can be used.

(vi) Administration. This function consists of three major features. The first function allows the DOE to revise the data by themselves. This function can be performed in case the new data, revised information reach the DOE by fax or other media channel, and the DOE must input the data by not using Import function mentioned on (iv). The second is the tool/utility for user control. This application could support two kinds of users, one for the administrator, and other, the general user. Only the administrator is allowed to handle the user maintenance, user monitoring and set TDP path because of security reason. If a new user will be registered or the profile of existing users changed, user maintenance function is used to follow those situations. The administrator is alco capable of checking other users' activity through user monitoring, and set TDP path on the exact data directory. For the general users, they might use the same PC but if the designated user is changed, the new user is required to change his/her ID using this function. The third is the historical indicator input function. To analyze PDP/TDP data, some statistical data are required. This function allows the DOE to input/update the statistical data.

The DOE is expected to be accustomed with this application. This application implements the fundamental requirements which are identified at this time. For example, the folder management where each data should be recorded and organized remains to be chosen by the DOE. The JICA Study Team hopes that the DOE will gain the knowledge and skills to manage large volume of data effectively using this application.

The TDP system

The function of TDP system is to analyze the difference of two data sets with the same format, and provide with a view that highlights the main differing points among the two files. TDP system accepts two kinds of data as an input;

1. TDP project profile
2. TDP project progress

TDP generates the Excel file which identifies the different points with an easy looking view.

7.2.2 equirements for System Operations

The main features of this application will follow. The detailed function and the direction how to use it will be will be covered by the operational manual.

THE PDP System

There are six tabs in the PDP system top page, and these are as follows:

(i) Data gathering. This tab is used to generate the data gathering form, specifying the period (Month or Year). PDP data control is located at the top pane and DDP data control is located in the bottom pane. The DOE are requested to check the necessary item, to select the proper period, and click the "Generate Data Entry" located at the bottom. The Excel file will be generated in the same directory as this application is located. The PDP and DDP data will be gathered monthly and/or annually. Utility companies' staff will download the data entry form which is on the Web, or will receive it by e-mail from the DOE. They will accomplish the form and submit it through e-mail or send diskette through postal mail to the DOE.

This function generates PDP and DDP data gathering form (Excel) which will be described to power generators and ECs. The generated Excel file will be located in the same directory where this PDP application is located.

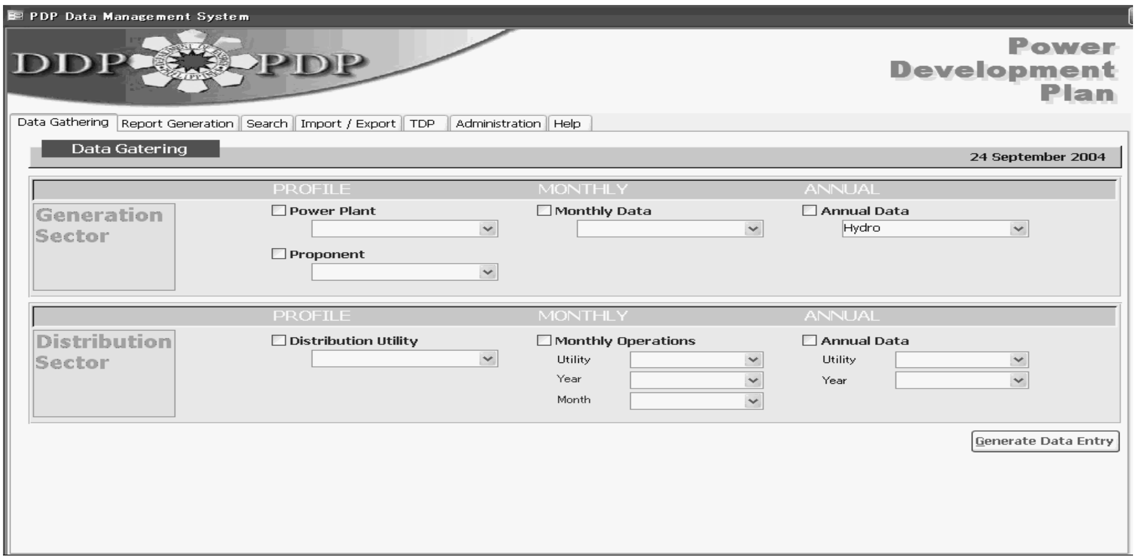


Figure 7.1 Main form : data gathering form generation

(ii) Data reporting. The DOE staff will import the data into application using the import function, and then analyze and prepare a report on results of analysis using this function. The generated report will be an Excel file and will be located in the same directory as this application is located.

This function creates several kinds of report automatically that are currently being prepared by the DOE manually. The DOE could chose utility name, year, and the summary report, performance index report and other reports that can be generated instantly. On the top of all reports that will be generated, there is a JICA logo mark. This is the function that the DOE requested as a top priority for this application.

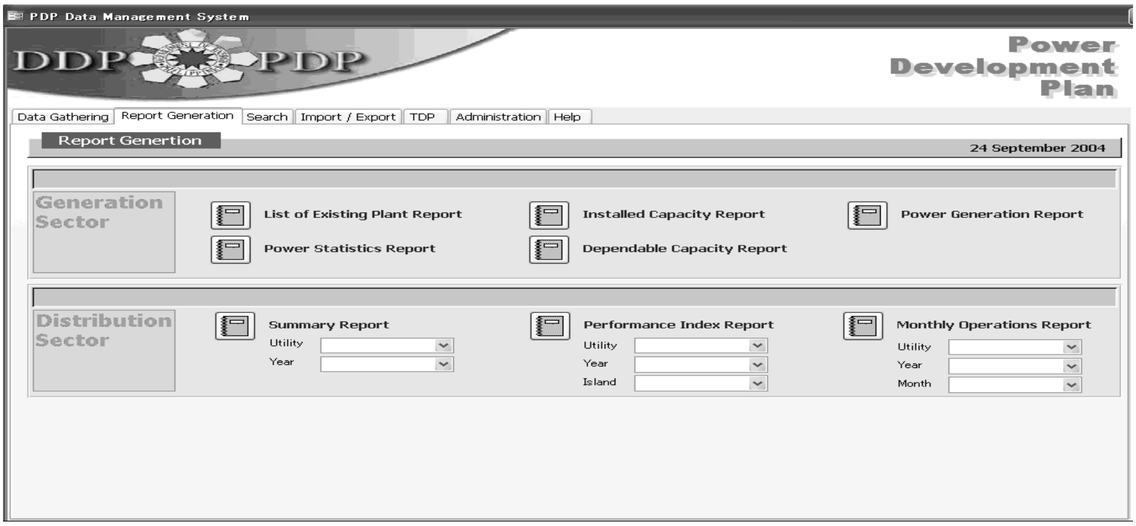


Figure 7.2 Main form : report generation

Figures 7.3 and 7.4 are two samples of reports that will be generated automatically. Figure 7.3 is the DDP data annual summary report for a specific EC. It covers the collected past data and the forecasted data for clients, level of electrification, projected infrastructure requirements and capital investment requirements, in the organized table style. On the top left, there is a graph which corresponds to the data in the table matrix below the graph. If the DOE would prepare this report manually, it would take time. This graphical image could help the user to understand the data trend at a glance. The DOE can specify the name of EC and period, and the corresponding summary report is generated shortly. Figure 7.4 is the overview of Performance index comparison among ECs. If the DOE is to prepare this report manually, it would take time, too. This graph will help the DOE to understand the performance difference between each ECs at a glance, and the DOE could easily choose ECs which shows the good practice, etc.

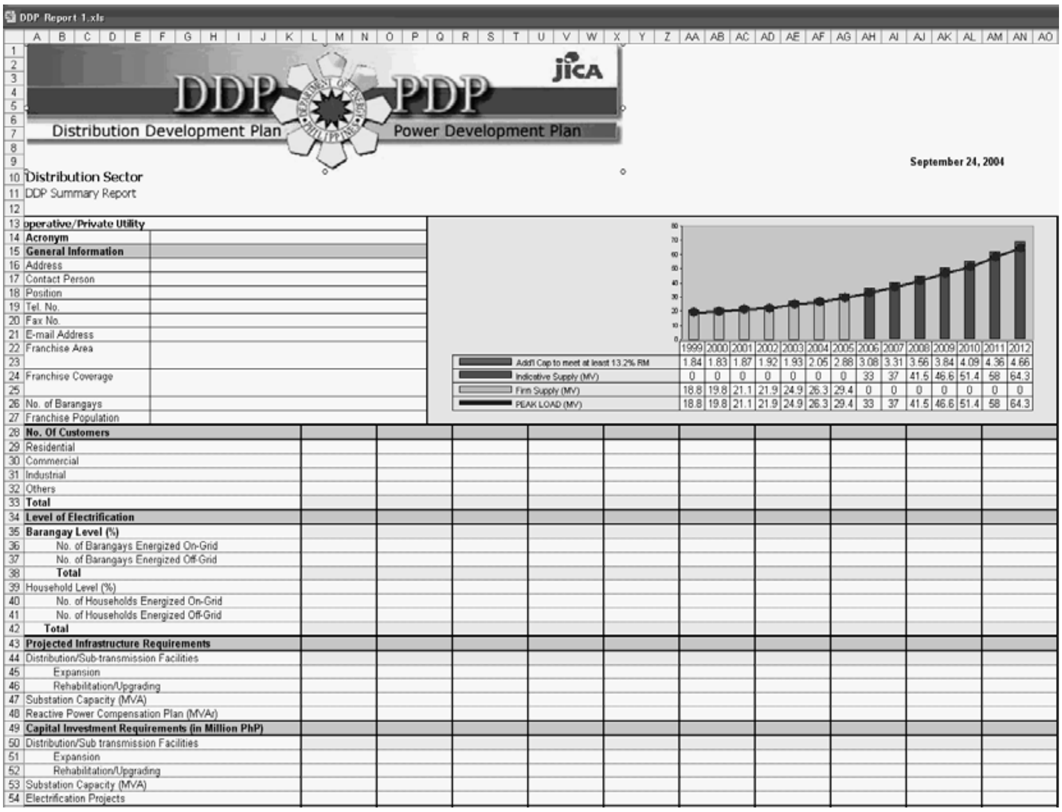


Figure 7.3 DDP annual summary format for each EC

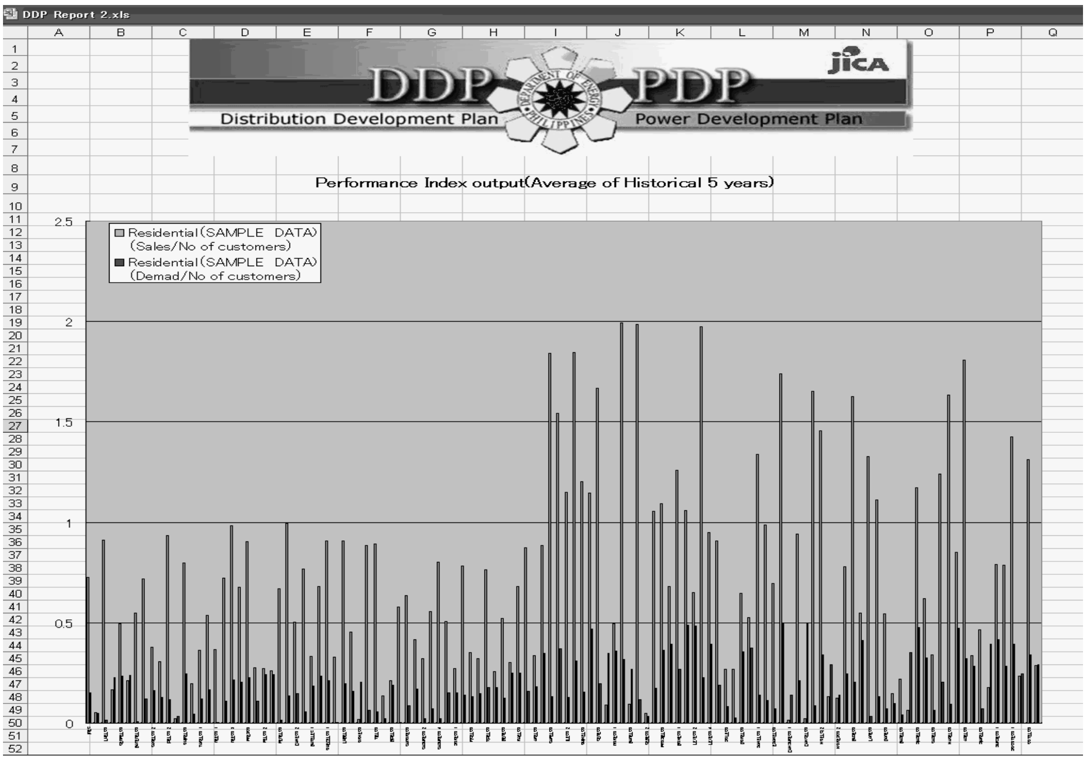


Figure 7.4 Performance index comparison among ECs

(iii) Search. This function enables the DOE to search, from view points of location, period, name, capacity, fuel, etc. This search function will become more effective when large volume of data are accumulated..

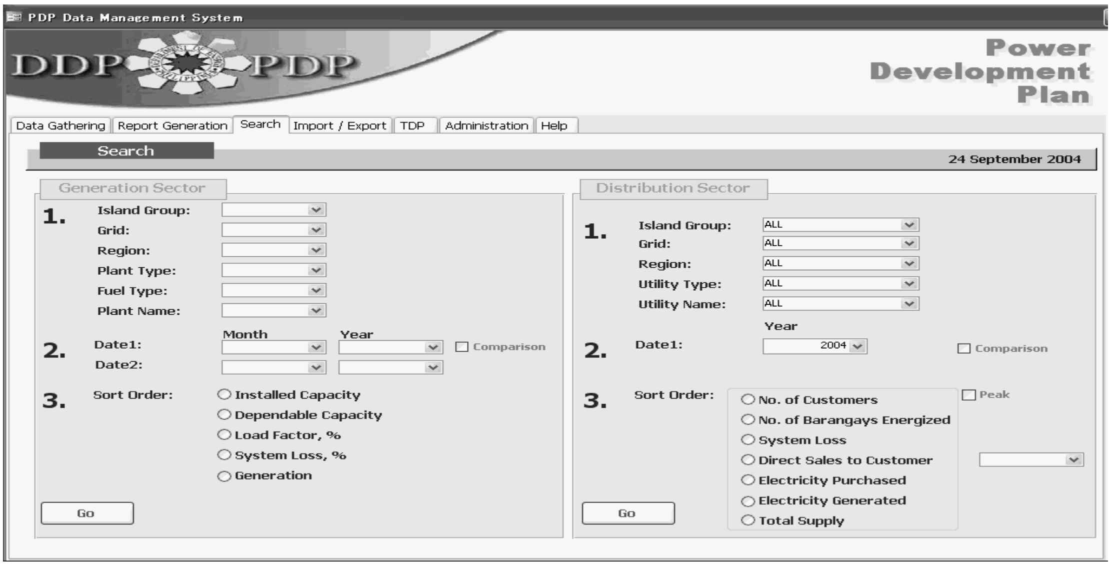


Figure 7.5 Main form : search

(iv) Import/Export. This function supports PDP/DDP gathered data import into this application. This function also supports to export data which are organized and sorted by other application requirement. As for export to other applications, GTMax and WASP-IV are supported.

Figure 7.6 Main form : Import/Export

(v) TDP path. This function allows the DOE to settle the path to TDP folders. To click this button, Explorer with TDP root data will be open where TDP data or application is held.

Figure 7.7 Main form : TDP path

(vi) Administration. This function supports user maintenance (ID/password control), user activity record etc, which will be handled only by the administrator. This function also allows the DOE to change profile data for PDP/DDP. Historical indicators can be input ted through this admin form.

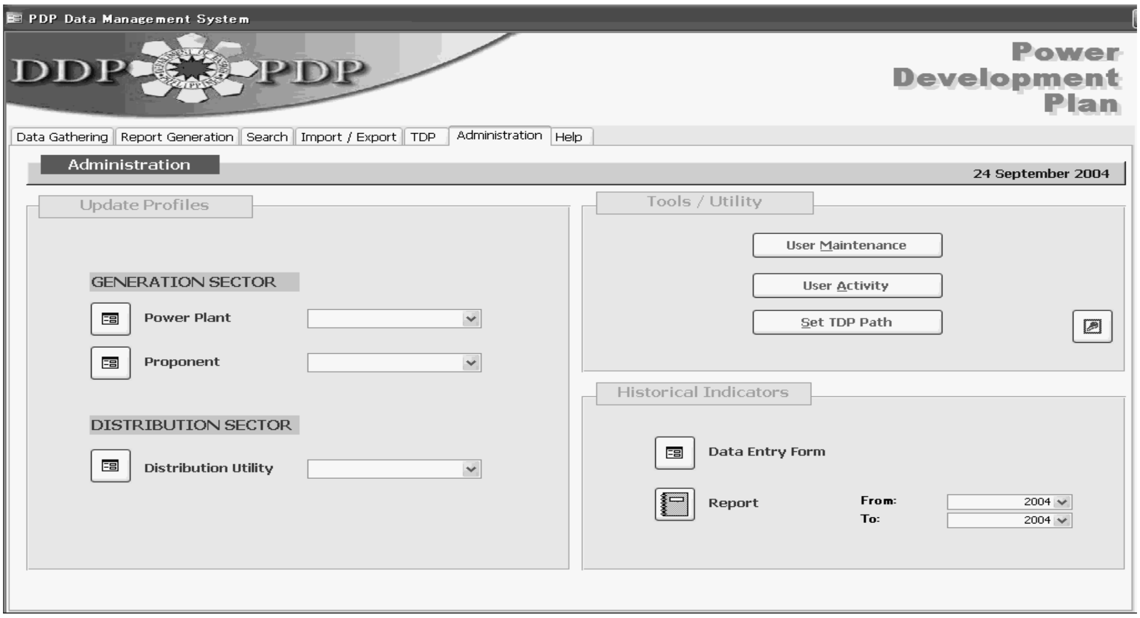


Figure 7.8 Main form : administration

TDP Data Analysis System

This application allows the DOE to make a data comparison analysis between two kinds of same formatted data easily, project record and the progress of project. If there are at least one point which are different from the previous data, the exact data entry and its previous data entry are shown comparatively, and the different point is shown with red color and different background for the DOE to identify it easily. At first, two different data, the old one and the new one, should be imported into this application. Following is the snapshot which the old data is imported into this application.

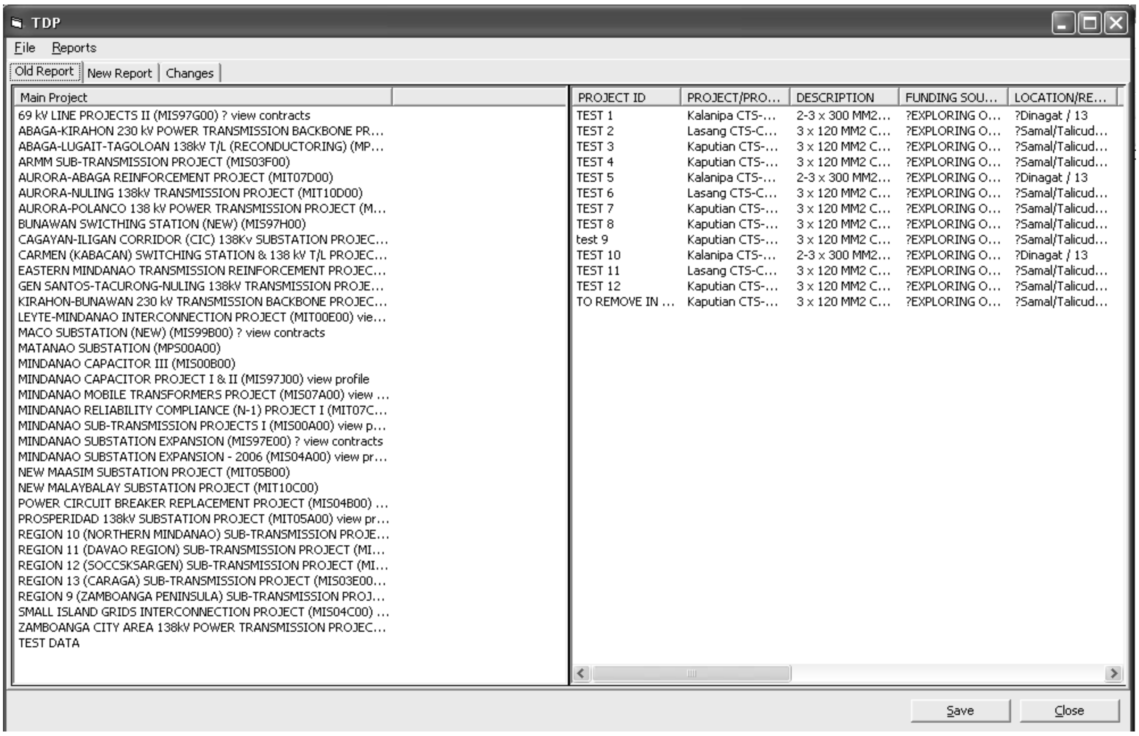


Figure 7.9 old data imported into application

Every project group are shown on the left pane and for each project group, the specific projects are shown on the right pane. After the old data and new data are imported, you can click the “save” button below and the following Excel file that clearly shows only the pair of different point with comparative view. Those generated file will be located in the TEST Data directory.

Followings are the snapshots of data comparison analysis result on project record and the progress of project.

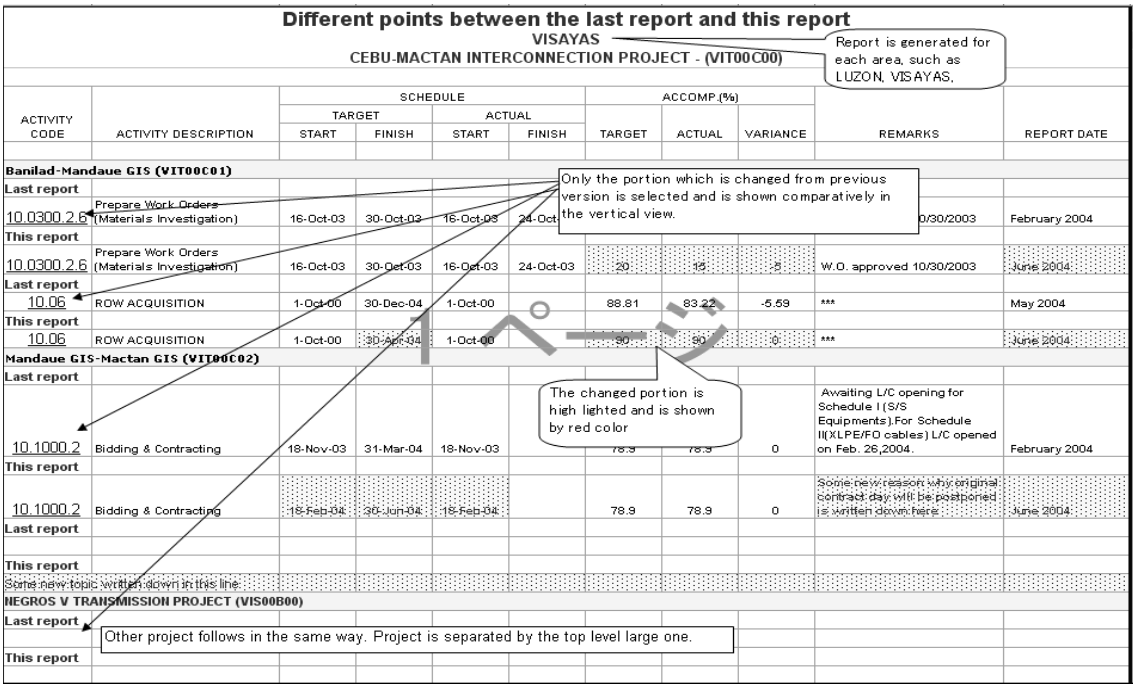


Figure 7.10 Project data comparison

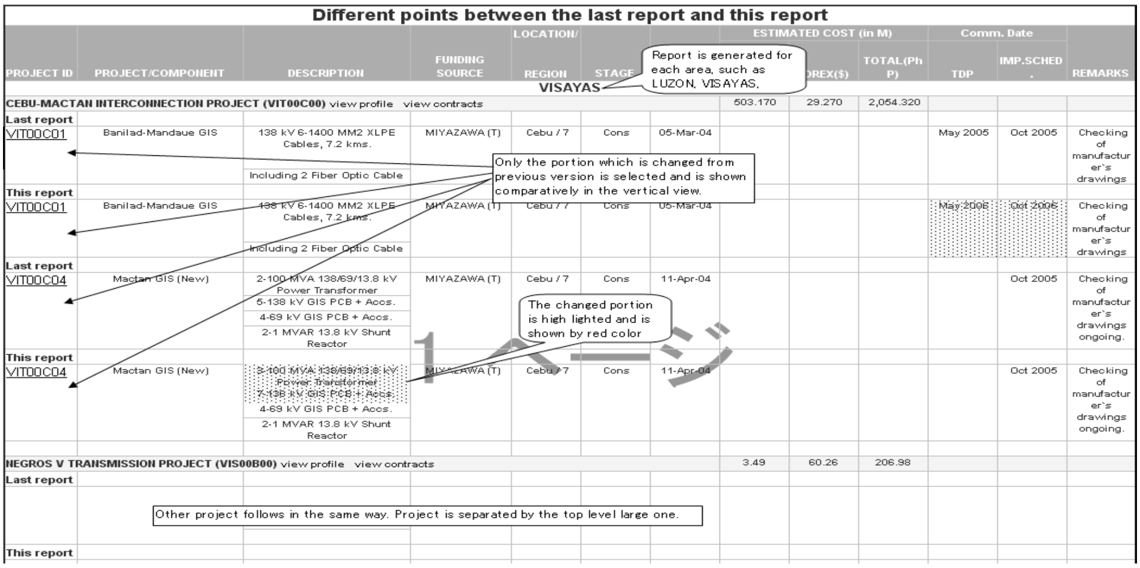


Figure 7.11 Progress of project comparison

7.3 Utilization of PDP Management System

The System performs the following functions, namely, data gathering, analysis and reporting,. The system it is expected to have the following effects:

- Improve the accuracy of data gathering, reduce the consumption time
- Improve the convenience of data analysis, reduce the consumption time
- Downsize the human manual operation

To operate this system, the following points are suggested.

(i) Directory management. All the generated data gathering forms, reports in the PDP data management system and the result comparison file in the TDP system will be located in the default directory. Since this application is a MS Office application, anybody could easily copy it on any directory in his/her own PC. Each user should manage the location of those generated files in his/her own PC environment at their best convenience.

(ii) Security. This application is a MS Office application and copy free application which is different from the EIPO system that is an Oracle application. The DOE is advised to control this application and data to the specific PC so that non-authorized person cannot have access to the data to copy, revise, delete or tamper them. Also, the administrator of this application is advised to check the activity of the other user periodically, to avoid the miss-operation and other troubles.

(iii) Output customization. The report and the downloaded data as a result of search function is in Excel format. Excel has its own tools and functions to edit and transform the excel file data. The DOE is advised to be accustomed to use the Excel function to edit and transform the output data for their additional requirements, to make the original, additional report which is not covered by this application.

(iv) System recovery. The DOE staff who is in charge of data management and system management should understand how to recover the system in case of application technical trouble. This application is a MS Office application so that simple periodical backup to other PC will be the easiest and essential way to avoid technical trouble.

(v) System revision. If the DOE would like to revise System, or need to recover technical trouble which might happened after system release, the DOE is advised to make a maintenance contract with its system development company.

8. Strengthening of Energy Investment Promotion Office

8.1 Introduction

Since the implementation of the EPIRA of June 2001, series of reform processes in the Philippine electric power sector have been initiated. The newly introduced electric power market mechanism, the WESM, is expected to improve the efficiency of the generation, transmission, distribution and supply sectors of the electric power sector. The reforms are progressing under the assumption that private capital inflow will continuously support the funding requirement of the supply-side, i.e., privatized electric power industry and considered a key success factor for the electric power market reforms and restructuring.

The previous study implemented in October 2002-March 2003 pointed out that three potential risks, i.e. (1) political and regulatory risks, (2) business risk in the IPP market and (3) non-transparent investment process, might prevent private sector investments. Particularly, political and regulatory risks demonstrated by long and tedious process of business approval, non-transparent approval process, and inconsistency between legal document and practical process are critical issues to be addressed by the Energy Investment Promotion Office (EIPO) of the DOE. One of the objectives of this follow-up study project is to assist the EIPO to effectively perform its mandate, thereby mitigating the negative impact of the above cited three investor's risks.

This component of the follow-up study implemented the following missions, namely:

(i) To examine the normal operation of the EIPO and assess if the EIPO mandate is efficiently managed

(ii) To examine the infomediary system and develop the EIPO website to facilitate access of potential investors to relevant energy information

(iii) To conduct interview survey to increase the number of participants from investors at the workshop to be held in November

This chapter consists of three sections. The first section statistically examines recent developments on the Philippine power sector reforms and identified the factors that prevent the inflow of direct and security investment. The second chapter describes how the market information is transacted between investors and sellers in the electricity market and carried out comparative analysis between the EIPO and other information provider that have already existed in the Philippines. The third section evaluates how the EIPO should be enhanced in the future from the viewpoint that mitigates asymmetric information between investors and the government.

8.2 The Philippine Electricity Sector Reforms and Investment

8.2.1 Electricity Sector Reforms and Investment Promotion

As noted in the previous study report, electricity sector structural reforms have started through the enactment of relevant laws since 1998. For instance, the Philippines, Thailand, Indonesia and Vietnam are the four Association of South East Asian Nations (ASEAN) countries that pursued the functional unbundling and privatization of the government owned and managed electric power company. These restructuring reforms require private capital infusion which the domestic market lacks. The influx of foreign investment, thus, is regarded as a key to effective structural reforms.

To date, privatization schedules are delayed in all the four ASEAN countries. The delays in the privatization efforts of these countries are caused by the following factors, among others:

- Sovereign bond ratings have been downgraded since financial crisis;
- Inward direct and securities investments declined; and
- Serious fiscal deficit problems.

One of the merits of the privatization of the government-owned power company is to reduce public subsidies. Especially in the case of Indonesia and the Philippine that are having very high fiscal deficit ratio to nominal GDP, the privatization efforts is aiming to reduce public expenditure to energy sector. However, it is turning out that the series of privatization initially require public funds to promote the process of the privatization.

Investors seem to regard the investment portfolio in each ASEAN power sector market with higher risks than that of sovereign bond. Particularly for the distribution sector, there is great imbalance in its configuration of having wide disparity in the size of the various distribution utilities; MERALCO being the biggest but with about 119 small to medium sized electric cooperatives and about 18 medium sized PIOUs. To monitor credit risks of the distributors is so difficult that foreign investors passively take a look at power sector in the recent years.

8.2.2 Recent Developments of Incoming Investment in the Electric Power Industry

Foreign Securities Investment

Although the Philippine government has promoted IPPs since the mid 1990s, recent inward securities investment to power sector is continuously diminishing. The incoming securities investment to power sector temporarilly exceeded 100 million USD per month in 1998, but the upward trend conversely turned in 2000 and it extremely got stagnated especially in 2003.

Figure 8.1 suggests that inward securities investment records big growth during the Estrada administration in 1998 and the Arroyo administration in 2001. The trend seems to support observation that foreign investors always expected that the new administration would provide preferential treatments to foreign investors. Accordingly, it is expected that the first period of the Arroyo administration in May 2004 will record increase of incoming securities investment temporarilly. However, it must be noticed that downward trend of the investment in the first Arroyo administration is much steeper than that of Estrada administration. In particular, the incoming investment decreased to 0.8 million USD per month in December 2002 – June 2003. Therefore, it can be expected that the investment temporarilly recovers when there is a new administration but the downward trend is remarkable in the long-term period.

Figure 8.1 also shows that this downward trend of the incoming investment is more serious in the Philippine power industry. This suggests that country credit risk is naturally one of the factors that diminish inward investment to the Philippine electric power industry.

Foreign Direct Investment

A decrease in inward foreign direct investment (FDI) to the power sector is also remarkable. According to FDI data published by the BOI, the inward FDI to the power sector expanded from 17.1 billion USD to 3.63 billion USD in 1996-1998. The FDI and the foreign securities investment, in 1998 started to decline.

Preferential tax treatment is generally applied to incoming FDI with BOI's approval and this approval is one of the incentives that influence foreigner's investment decision. Actually, preferential treatments have been applied to approximately 90 percent of total FDI in the second half of 1990s and this is believed to encourage the incoming FDI during this period. However, recent FDI stagnation showed that this investment promotion policy hardly stimulate investor's incentives since 1998 and suggests that other factor that potentially influence the incoming FDI must be considered.

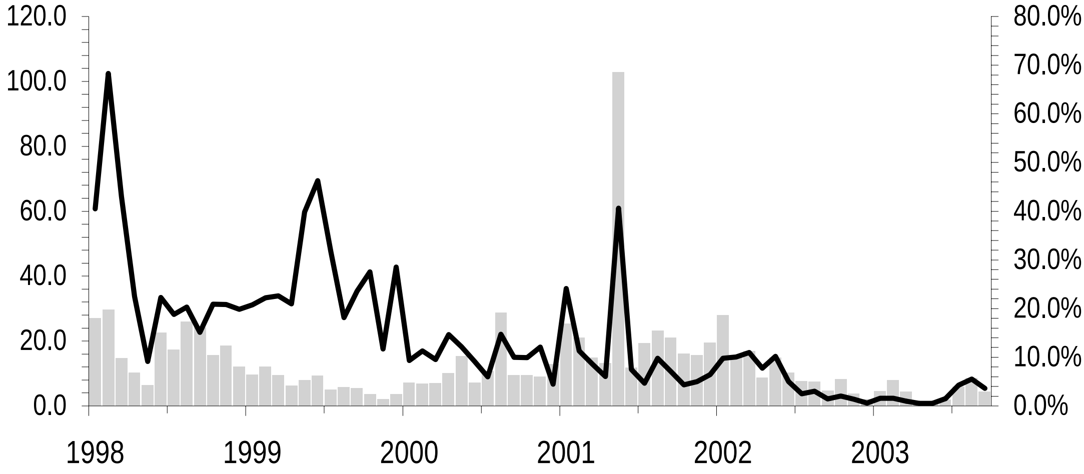


Figure 8.1 Inward Foreign Securities Investment in the Philippine Power Sector Source: Bangko Sentral ng Pilipinas

Note: Left axis –Inward Securities Investment in the Power Sector Mil USD,

Right axis – Inward Securities Investment in Power Sector / Total Inward Securities Investment

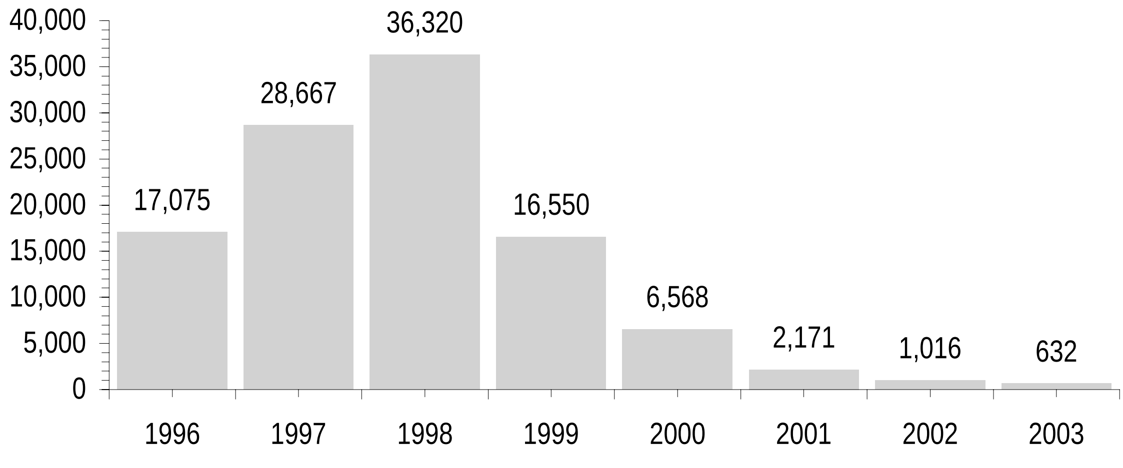


Figure 8.2 Inward Foreign Direct Investment in the Power Sector Approved by the BOI

Source： Board of Investments

Note：Million Philippine Peso

Table 8.1 The Number of BOI's FDI Approvals with/without Preferential Tax Treatment

	The Number of Investment Apprived by BOI Total	The Number of Investment with Preferential Treatment	The Number of Investment without Preferential Treatment
1995	480	476	4
1996	460	446	14
1997	490	482	10
1998	252	250	2
1999	231	227	4
2000	172	166	6
2001	230	223	5

Source：Board of Investments

Macroeconomic analysis of power sector investment

The two previous sections can be summarized as follows:

- Both securities and direct investment to the Philippines have continuously been declining;
- The decrease in incoming investment to the Philippines has not always occurred only in the power sector, but downward trend of the investment to the power sector is quite steep;
- For foreign direct investment, few investments with no tax preferential treatments were implemented, in other words, foreign investors regard these treatments very important for their investment decision.

This section statistically examines what determines a decline in incoming foreign securities investment and direct investment in the Philippine power sector. To verify this effect, we estimated two types of power sector inward investment function and verified what explanatory variables significantly influence the incoming investments. Two types of inward investment functions are (1) inward foreign securities investment function and (2) inward foreign direct investment function. Two equations estimated in this section are as follows;

$$\ln FSI_t^{Elect} = const + \alpha_1 \ln EC_t + \alpha_2 \ln CR_t + \alpha_3 \ln MC_t^{PSE} + \alpha_4 Dum1 + \alpha_5 Dum2 + \alpha_6 Dum3 + \alpha_7 Dum4 + \mu_t \quad (8\cdot1)$$

$$\ln FDI_t^{Elect} = const + \beta_1 \ln GDP_t + \beta_2 \ln EC_t + \beta_3 \ln CR_t + \beta_4 \ln MC_t^{PSE} + \beta_5 Dum1 + \beta_6 Dum2 + \beta_7 Dum3 + \beta_8 Dum4 + \nu_t \quad (8\cdot2)$$

FSI: Inward Foreign Securities Investment in Power Sector (Published by BSP)
FDI: Inward Foreign Direct Investment in Power Sector (Published by BOI)
EC: Domestic Electricity Consumption
CR: S&P Credit Rating of the Philippine Foreign Currency Sovereign Bond
MC: Market Capitalization of the Philippine Stock Exchange

The above equations consider how incoming foreign investment in the Philippine power sector is influenced by each explanatory variable, i.e., (1) domestic electricity demand, (2) Country Risks and (3) domestic market capitalization. As for (2) S&P Country Credit Risks, we employed default probability data published by S&P's annual default study. Equation (8.1) employed monthly historical data from January 1998 to September 2003 and (8.2) used quarterly data from 1st quarter of 1996 to 1st quarter of 2004.

Four (4) types of dummy variables are added to both (1.1) and (1.2) equations in this empirical study, i.e., time-trend dummy and three administration dummies. The administration dummies are (1) Ramos administration dummy (1996 January -1997 June), (2) Estrada dummy (1998 July-2000 January) and Arroyo administration dummy (2001 February-present).

Table 8.2 Estimation Results of Determinants of FSI to Power Sector

	Coefficient	t-value
α1	-8.569 ***	-6.060
α2	-0.141 *	-2.320
α3	0.625 ***	9.060
Constant	124.000 ***	6.240
R2	0.689	
Observations	69.000	

Table 8.3 Estimation Results of Determinants of FDI to Power Sector

	Coefficient	t-value
β1	1.150	0.130
β2	19.776 **	2.390
β3	0.274 **	2.440
β4	-3.760	-0.990
β5	1.850	0.570
Const	314.780	0.090
R2	0.513	
Number of Observations	33.000	

Micro-economic Analysis of Power Sector Investment

The purpose of this section is to re-examine the previous macro-economic study from a viewpoint of micro-economics. The previous macroeconomic study verified what determines inward foreign securities and direct investment, but this section considers how the Philippine power sector performs in the recent years as targets of foreign investors by using financial statements data of the publicly listed electricity firms.

In the Philippine Stock Exchange (PSE), five generators and distributors are listed as of August 2004. Summarizing the financial data of the five listed generators and distributors: four of the five firms recorded net losses as of December 2002 while MERALCO recorded growing gross sales; PhP135 billion sales in 2003, from PhP120 billion sales in 2002. As a corollary to the observed declined inward investment during the period, to attract foreign investors, each firm must improve cost efficiency. Therefore, macroeconomic and microeconomic considerations have coupling effect on inward investment.

Looking at the ownership structure of the Philippine electricity industry poses problem due to insufficiency and unavailability of relevant information. Even transparent firms show that an entry to owner's market is very restricted for foreign investors. For instance, First Philippine Holdings, Inc. has not disclosed any ownership information as of August 2004. There are few firms with disclosed ownership information in global capital markets; otherwise, foreign investors choose to invest in other countries.

In addition, PCD Nominee Corp. is oftentimes found as a big shareholder in the power sector. The Philippine government has historically promoted incoming foreign investment and this has resulted in ownership concentration of PCD and other public institutions. High ownership concentration is typically shown in MERALCO and East Asia Power Resources and these suggest that the Philippine government and issuers must consider the foreign investor's protection policy.

Table 8.4 Corporate Performance and Ownership Structure of Electricity Firms Listed in the Philippine Stock Exchange

1.ALSONS CONSOLIDATED RES INC

	2000 December	2001 December	2002 December	2003 December
Sales	3,591	4,061	4,204	
Operating Profit	1,394	1,694	1,526	
Net Profit	106	-417	-10	
EPS	0.020	-0.066	-0.002	
Business				
1 ENERGY FEE	2,545	286	2,888	
	70.9%	7.0%	68.7%	
2 SALE OF GOODS	621	621	888	
	17.3%	15.3%	21.1%	
3 POWER SALES & SERVICE	-	158	205	
	0.0%	3.9%	4.9%	
Shareholder				Ownership Ratio
1 Alsons Corporation				41.2%
2 Alsons Power Holdings Corp.				19.9%
3 Alsons Development and Investment Corporation				18.9%
4 PCD Nominee Corporation(Filipino)				14.1%
5 Niacor Corporation				2.5%

Source：Bloomberg, Million Philippine Peso

2.FIRST PHILIPPINE HOLDINGS, INC.

	2000 December	2001 December	2002 December	2003 December
Sales	9,091	16,778	24,125	38,424
Operating Profit	3,359	7,280	6,946	9,567
Net Profit	1,090	3,862	-3,025	7,367
EPS	2.040	7.135	-5.540	6.995
Business				
1 POWER		15,181	23,358	37,171
		90.5%	96.8%	96.7%
2 OTHER		1,597	787	1,253
		9.5%	3.3%	3.3%
Shareholder				Ownership Ratio
1	N.A.			
2	N.A.			
3	N.A.			
4	N.A.			
5	N.A.			

Source：Bloomberg, Million Philippine Peso

3.MANILA ELECTRIC COMPANY

		2000 December	2001 December	2002 December	2003 December
	Sales	107,038	132,710	120,044	135,035
	Operating Profit	6,213	5,587	1,492	5,998
	Net Profit	2,490	1,481	-28,181	907
	EPS	2.400	1.400	-28.276	0.825
Business					
1	POWER DISTRIBUTION		129,367	117,791	131,987
			97.48%	98.12%	97.74%
2	REAL ESTATE		1,877	977	2,235
			1.41%	0.81%	1.66%
3	SERVICES		1,466	1,276	813
			1.10%	1.06%	0.60%
Shareholder					Ownership Ratio
1	PCD Nominee Corporation(Foreign)				23.1%
2	First Philippine Union Fenosa, Inc.				23.0%
3	PCD Nominee Corporation				14.5%
4	Meralco Pension Fund				8.8%
5	Republic of the Philippines				4.8%

Source：Bloomberg, Million Philippine Peso

4.EAST ASIA POWER RESOURCES

		2000 December	2001 December	2002 December	2003 December
	Sales	5766	3804	3647	
	Operating Profit	249	-84	-447	
	Net Profit	-1784	-3007	-1162	
	EPS	-0.5	-0.85	-0.33	
Business					
1	POWER GENERATION	5,766	3,804	3,647	
		100.00%	100.00%	100.00%	
2	-				
Shareholder					Ownership Ratio
1	EPHE Philippines Energy Company, Inc				91.7%
2	PCD nominee Corporation(Nopn-Filipine)				3.9%
3	PCD Nominee Corporation(Filipine)				1.5%
4	Victor S. Chiongbian				1.1%
5	JMJ Holdings corporation				0.6%

Source：Bloomberg, Million Philippine Peso

5.SALCON POWER CORP

		2000 December	2001 December	2002 December	2003 December
	Sales	978.4	1,189	1,399	1,467
	Operating Profit	489.8	868	792	788
	Net Profit	702.5	862	567	854
	EPS	0.5	0.61	0.39	0.57
Business					
1	GENERATION		1,184	1,179	1,248
			99.56%	84.30%	85.08%
2	DISTRIBUTION		135	219	219
			11.36%	15.65%	14.92%
3	OTHER		5	1	-
			0.44%	0.04%	0.00%
Shareholder					Ownership Ratio
1	Salcon Philippines, Inc.				39%
2	JAD Holdings, Inc.				19%
3	Interpid Holdings, Inc.				19%
4	Rayfield Holdings, Inc				5%
5	ATC Enginering Sdn Bhd				4%

Source：Bloomberg, Million Philippine Peso

8.3 Infomediary System in the Philippine Power Sector

8.3.1 Recent Information Providers in the Philippine Power Sector

The infomediary system of power sector investment consist of various government agencies and multilateral body that include the Board of Investment (BOI), ERC, United Nations Development Programme (UNDP), PSALM and others. Among these information providers, the BOI provides information on incentives and other preferential treatment; the ERC provides information regarding regulations imposed on power sector investment and the UNDP supplies renewable energy information. In addition, information of power sector assets privatization is being provided by the PSALM;, and power sector market information is collectively being provided by the DOE, TRANSCO and the PEMC. There is a growing list of information providers in the power sector as the restructuring and reform processes progress.

In addition to the diversified infomediary system, investors encounter difficulties in the practical procedure to be followed, which is unclear even though an investor has made an investment decision. For instance, investors find it hard to obtain information as to which government organization they should submit their applications to, the period and cost of the approval, etc. Furthermore, the guidelines given to investors is sometimes inconsistent with the practical process that is actually happening. Reflecting these complicated circumstances, the BOI recently established "One Stop Action Center" in its organization with other agencies' supports.

To enhance the EIPO web-site contents, this section reviews principal infomediaries in the Philippine power sector market and highlights the advantages and disadvantages of each of them. The targeted goal of this section is to then conclude how the EIPO supplements gaps of the existing infomediaries and satisfy investors by studying optimal infomediary system in the liberalized power sector market.

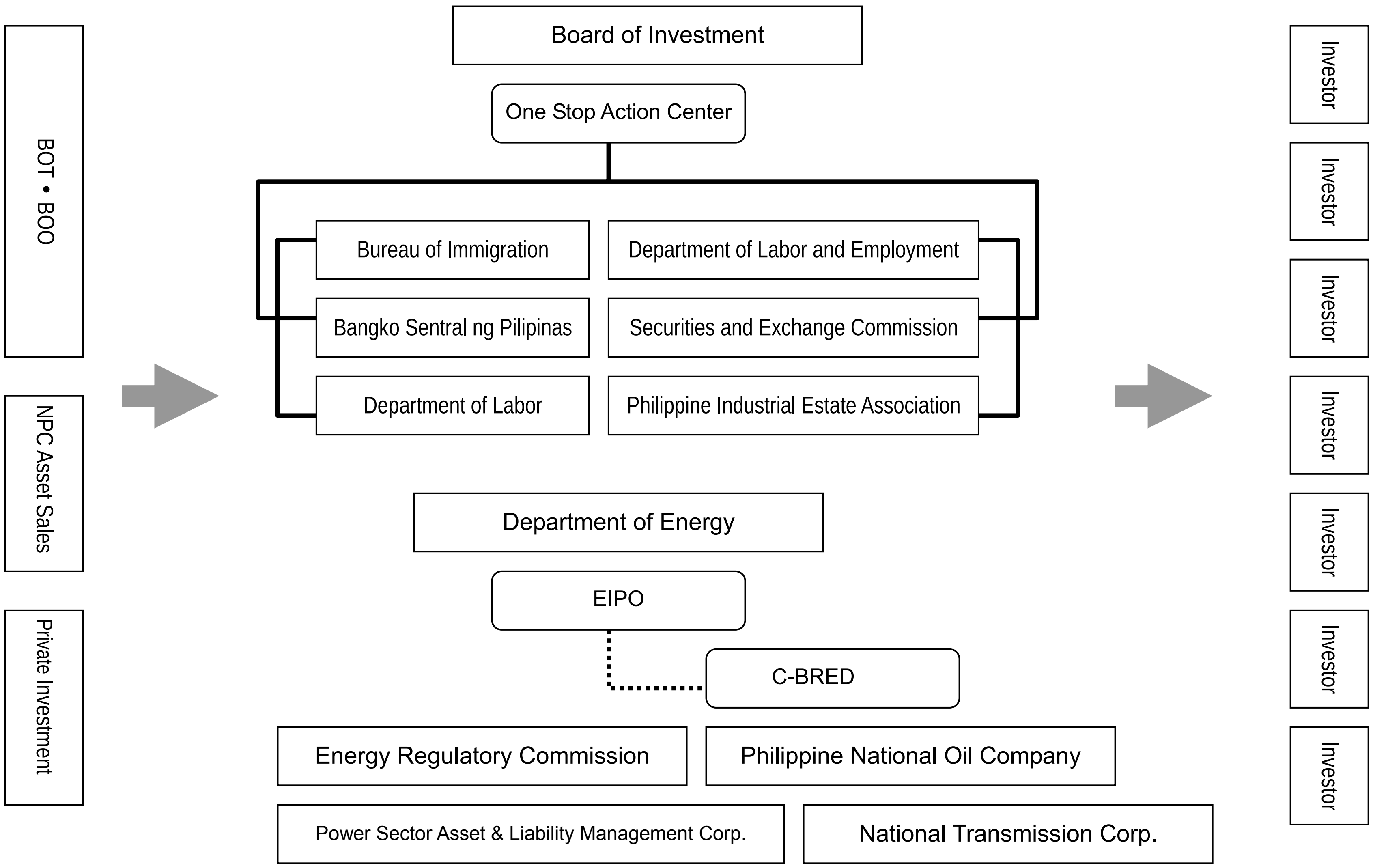


Figure 8.3 Informediary System in the Philippine Power Sector

Table 8.5 Infomediary Agencies in the Philippine Power Sector Classified by Type of Contents

		Supervisor	Project Information	Investor's Information	Information of Preferential Treatment	Guidance of Permission Procedure		
						Central Government	Local Government	Others
One-Stop Type	DOE-EIPO	DOE	○	○				
	BOI-OSAC	BOI			○			
	C-Bred	DOE、UNDP	○	○				
Home page Type	ERC HP	ERC				○		
	DENR HP	DENR				○		
	PSALM HP	PSALM	○					
	Transco HP	Transco	○					

8.3.2 Information Providers in the Philippine Power Sector Market

BOI's One Stop Action Center

The BOI's One Stop Action Center (OSAC) is established not only for power sector investors, but for all the fields of investors. The OSAC provides market information to investors and also offers man-to-man counseling to investors. Since incoming foreign investment is under the authority of the BOI, the OSAC can monitor each approval procedure and provide advisory supports to applicants. The OSAC provides the following information;

- ・ Procedure when foreign firms establish business offices in the Philippines;
- Procedure on applying for working visa;
- Procedure on converting from sightseeing visa to working visa;
- Procedure on obtaining preferential tax treatments and incentives; and
- General information concerning investment environment in the Philippines.

The advantage of the BOI's OSAC is that the BOI is the authority regarding incoming foreign investment approval, and application is within its organization.

A major difference between the EIPO and the OSAC is that the EIPO focuses only on power sector market while the OSAC covers all fields of investment. In addition, while the the OSAC provides counseling service, EIPO does not, since the EIPO does not have any jurisdiction on investment approval in the power sector market.

Considering the above differences between the EIPO and the OSAC viz-a-viz their advantages and disadvantages, the EIPO must be considered to be in optimal coexistence with the OSAC. For instance, since the EIPO does not have a counseling service, the EIPO web-site is a principal infomediary system that investors initially visit and the OSAC provides man-to-man counseling service once investors make an investment decision and submit application to the related government agencies.

CBRED: Capacity Building to Remove Barriers to Renewable Energy

The CBRED is a technical assistance initiative financed by the UNDP with the DOE is the executing agency. The purpose of the project is to eliminate barriers that have historically prevented the development of renewable energy in the country. The major programs of the technical assistance are the following :

- Capacity building of the DOE’s human resources to develop and promote renewable energy development policies and strategies;
- Information system building to increase participants of renewable energy market;
- Development of effective coordination mechanism for government agencies concerned with renewable energy;
- Development and promotion of renewable energy to regional communities, and;
- Research and development of renewable energy.technologies.

Furthermore, the above programs will implement the following activities:

- ・Capacity building of legal and planning system;
- Legislative arrangements of the service in renewable energy market;
- Information system service;
- Arrangements of electricity distribution system and funding mechanism;
- ・ Human resource development; and
- Technical support.

Among these programs and activities, investment promotion will be carried out in information system services. A local private consulting firm, Soluziona, has been commissioned by the UNDP. to create related websites for the CBRED and the Market Service Center (MSC). To date, the website is independently being developed under the the UNDP project, but it will be managed by the EIPO. According to the Soluziona team leader , Mr. Ruben R. Lambuson, the CBRED web-site will provide information only on renewable energy contents. Therefore, the various DOE units involved, such as the EIPO, the Information Technology Management Services (ITMS) and the Renewable Energy Management Division (REMD), must develop proper protocol to maximize the various information systems being developed and minimize overlaps.

ERC Homepage

The ERC as the regulator of the energy industry has been providing information concerning regulatory guidelines, and procedures, among others, through its homepage. The ERC and the DOE are primarily concerned when an investor plans an investment project. In this regard, most investors first take a look at the ERC's homepage to obtain information regarding permission (e.g. accreditation) process guidelines and other relevant regulatory guidelines and issuances.

The ERC differs from the BOI's OSAC, in that it does not provide man-to-man counseling service to each individual investor. Considering the ERC's position as one of the infomediaries, the ERC website does not overlap with the interactive style of OSAC, rather it follows the EIPO one-way information system. Therefore, the EIPO should take into account arrangements between the ERC and EIPO's contents to strengthen its competitiveness as an informediary.

PSALM Homepage

While the ERC provides investors with regulatory related information, the PSALM offers asset sales information under the privatization process. The PSALM's information is praised by many investors since it contains many useful micro-data regarding each power plant.

Asset sales information include micro-data of power plants, electric power distribution equipments and IPPs. The privatization schedule is periodically updated. Information that PSALM provides includes many contents that the EIPO does not contain. Accordingly, the EIPO should contemplate optimal coordination with the PSALM to enhance its website contents.

Table 8.6 PSALM's Privatization Schedule of Power Generation Infrastructure

City	Type	Name		Built	Capacity	Remaining Life (yrs) (as of Dec 31, 2001)
Luzon	Hydro	Angat	Angat Hydroelectric Power Plant	1967-1992	245MW	50
		Barit	Barit Hydroelectric Power Plant	1957	1.8MW	14-25
		Caliraya	Caliraya Hydroelectric Power Plant	1942-1950	32MW	-
		Magat	Magat Hydroelectric Power Plant	1984	360MW	32
		Masiway	Masiway Hydroelectric Power Plant	1980	12MW	-
		Pantabangan	Pantabangan Hydroelectric Power Plant	1977	10MW	25
	Geothermal	Bac-Man	Bac-Man Geothermal Power Plant	1993-1998	150MW	21-26
		Mak-Ban	Mak-Ban Geothermal Power Plant	1979-1996	40MW	11-26
		Tiwi Plant	Tiwi Geothermal Power Plant	1979-1982	275MW	11
	Coal	Batangas	Bantagas Coal-Fired Thermal Power Plant	1984-1995	600MW	23-34
		Masinloc	Masinloc 1 & 2 Coal-Fired Thermal Power Plant	1998	600MW	26
	Diesel	Bataan GT	Bataan Gas Turbine Power Plant	1989	120MW	Under Preservation
		MALAYA GT	Malaya Gas Turbine Power Plant	1989	90MW	Under Preservation
		Sucat GT	Sucat Gas Turbine Power Plant	1992	30MW	Under Preservation
	Bunker C	Bataan	Bataan Termal Power Unit	1972	75MW	Under Preservation
		Sucat	Sucat Termal Power Unit	1968-1972	850MW	Under Preservation
		Manila	Manila 1&2 Termal Power Plant	1965-1966	200MW	Under Preservation
Visayas	Hydro	Amlan	Amlan Hydroelectric Power Plant	1962	0.8MW	20
		Loboc	Loboc Hydroelectric Power Plant	1957-1967	1.2MW	50
	Geothermal	Leyte I	Leyte I Geothermal Power Plant	1983	112.5MW	13
		Palinpinon	Palinpinon Geothermal Power Plant	1980-1995	195.5MW	18
	Bunker C	Bohol	Bohol Diesel Power Plant	1978-1996	22MW	15
		Panay	PanayDiesel Power Plant	1979-1983	36.5MW	5—10
		Power Barges	Power Barges	1981-1992	128MW	-
Mindanao	Hydro	Agus	Agus Hydroelectric Power Plant	1979-1994	727.1MW	-
		Agusan	Agusan Hydroelectric Power Plant	1957	1.6MW	50
		Pulangui IV	Pulangui IV Hydroelectric Power Plant	1985-1986	255MW	-
		Talomo	Agusan Hydroelectric Power Plant	1998	3.52MW	NA

Source: MRI based on PSALM's Homepage

Table 8.7 IPP Participants Disclosed by PSALM's Homepage

City	Type	Name		Commercial Operation	Capacity	End of Contract Period
Luzon	Hydro	Ambuklao	Ambuklao Hydro Power Plant	1995	75MW	October 2000
		Binga	Binga Hydro Power Plant	1993	100MW	August 2008
		Casecnan	Casecnan HydroElectric Plant	2002	140	April 2022
		CBK	Caliraya-Botokan-Kalayaan Hydroelectric Plants	2002-2004	650MW	25years
		Bakun	Bakun Hydroelectric Power Plant	2000(I),2001(II)	70MW	2026(I),2025(II)
		Benguet(HEDCOR/NMHC)	Benguet Province Mini-Hydro	1993	30.6MW	Jauary 201
		San Roque	San Roque MultiPurpose Project	2004	345MW	February 2004
	Geothermal	MakBan-Ormat	Mak-Ban Binary Cycle Geothermal Power Station	1994	15.73MW	March 2004
	Coal	Pagbilao	Pagbilao Coal - Fired Thermal Power Station	1996	700MW	August 2025
		Sual	Sual Coal - Fired Thermal Power Plant	1999	1000MW	October 2024
	Bunker C	Bataan EPZA	Bataan EPZA Diesel Plant	1994	58MW	June 2004
		Bauang	Bauang Bunker - Fired Diesel Generator Power Station	1995	215MW	February 201
		Cavite(Magellan Cogen)	Cavite Diesel Cogeneration Power Plant	1995	63MW	December 2005
		Malaya	Malaya Thermal Power Plant	1995	650MW	September 2010
		Pinamucan	Pinamucan Bunker Fired Diesel Generator Power Station	1993	105MW	June 2003
		Subic II	Subic Bunker - Fired Diesel Generator Power Station II	1994	108MW	March 2009
	Diesel	Limay A & B	Limay Bataan Combined Cycle GTPP(Block A & B)	1993-1995	600MW	A:Oct2004,B:Jan 2010
		Navotas 1-3 & 4	Navotas Gas Turbine Power Stations Units 1-3 & Unit 4	1991(1-3),1993(4)	310MW	1-3:Jan 2003,4:Mar2004
	Natural Gas	Ilijan	Ilijan Natural Gas Combined Cycle Power Project	2002	1200MW	20years
	LSWR	San Pascual	San Pascual Cogeneration Power Production Facility Project	2004	304MW	January 2002
Visayas	Geothermal	Leyte A & B	Leyte Geothermal Power Plant(Leyte A & Leyte B)	1997(A), 1998(B)	640MW	A:Nov 2022,B:Apr 2023
	Diesel	Naga - CTPP I & II	Naga Power Plant Complex (Cebu Thermal Power Plant I & II)	1997(I), 1995(II)	106.8MW	May 2009
		Toledo	Toledo Cebu Coal Thermal Power Plant	1993	80MW	February 2003
	Bunker C	Naga - LBTG I & II	Naga Power Plant Complex (Land Based Gas Turbine I & II)	1994	55MW	May 2009
	Diesel	Naga - CDPP	Naga Power Plant Complex (Cebu Diesel Power Plant)	1995	36MW	May 2009
Mindanao	Geothermal	MAGPP I	Mindanao I Geothermal Plant (Mt. Apo)	1997	47MW	February 2022
		MAGPP II	Mindanao II Geothermal Power Plant (Mt.Apo)	1999	48.25MW	June 2024
	Bunker C	Iligan I & II (ALSONS)	Iligan Bunker - Fired Diesel generationg Power Station (I & II)	1993	98MW	Jul 2003(I), Dec 2004(II)
		GenSan	General Santos Bunker C Fired Diesel Power Plant	1998	50MW	March 2016
		Mindanao Barges	Mindanao Diesel Power Barges(PB 117 & PB 118)	1994	200MW	July 2009
		Zamboanga	Zamboanga Bunker C Fired Diesel Power Plant	1997	100MW	December 2015

Source: MRI based on PSALM's Homepage

8.4 Towards An Optimal Infomeriary System in Power Sector Market

8.4.1 Assignments and Role of EIPO System

One of the original objectives in establishing the EIPO system is to mitigate asymmetric information problem existing between sellers and buyers in the power sector market. In the previous section, this study reviewed the major existing power sector infomediaries and discussed the relationship between the EIPO and others. It was suggested in the previous section that in order to achieve one of the EIPO's goal, "One Stop Shopping Center," the EIPO's contents should be enhanced by coordination with other government agencies and consolidatation of the contact details of all electric power industry participants into the EIPO system.

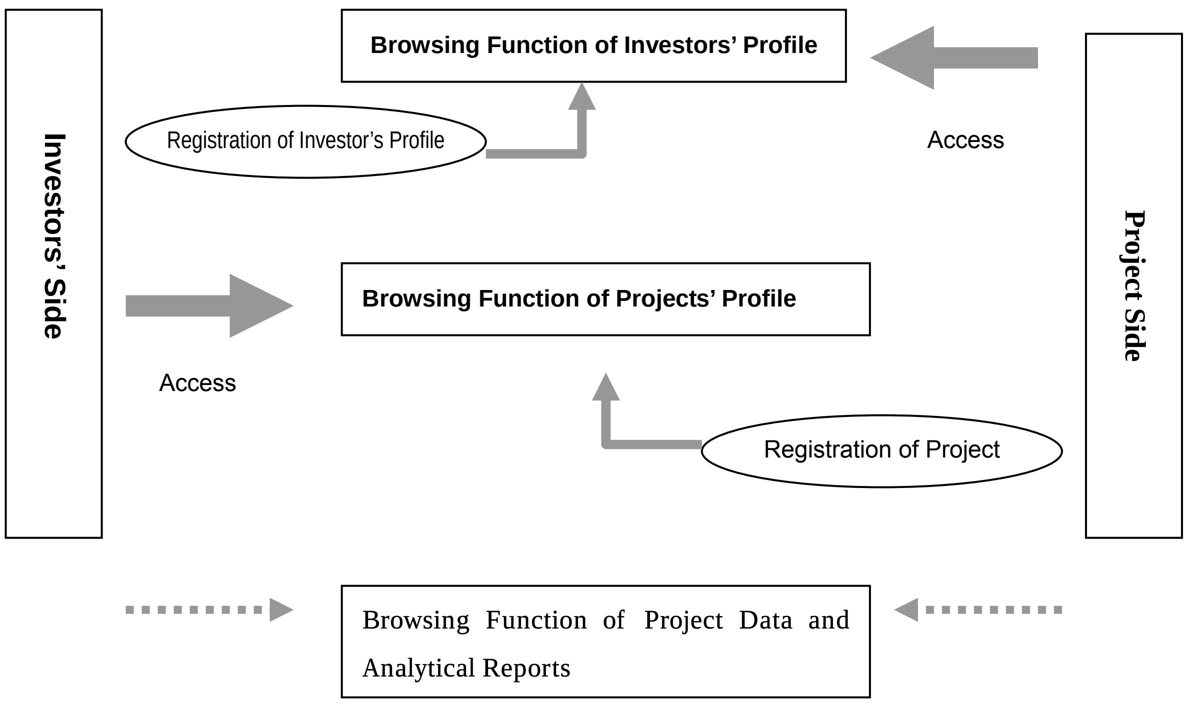


Figure 8.4 Conceptual Scheme of the EIPO System

Source: MRI based on Department of Energy

8.4.2 Requirements of the Optimal EIPO System

As described in the previous firgure, the EIPO system is positioned as the central infomediary system of investment opportunities in the power sector market, so that, as the number of the registered investors and projects increase, more users can enjoy its benefits. And with the enhanced EIPO system, more and more registrants will invite more and more future users. However, potential investors in the Philippine power sector market do not yet recognize the existence of the EIPO system and they are not aware of the benefits of registering with the system as well.

The DOE has also initiated the development of a comprehensive information system for the monitoring and evaluation of the electric power industry reforms. This is called the Power Tracker of which the initial development was supported by the United States Agency for International Development (USAID). The Power Tracker is still in the continuing developmental stage. All these parallel efforts on information system development should be spearheaded by the DOE and should be building upon the on-going activities by partner agencies. In the area of encouraging private investors in the country's electric power sector, the DOE's challenge is to develop and launch an investor friendly EIPO system and at the same time conduct workshops or practical forums to establish contact with as many as possible potential investors.

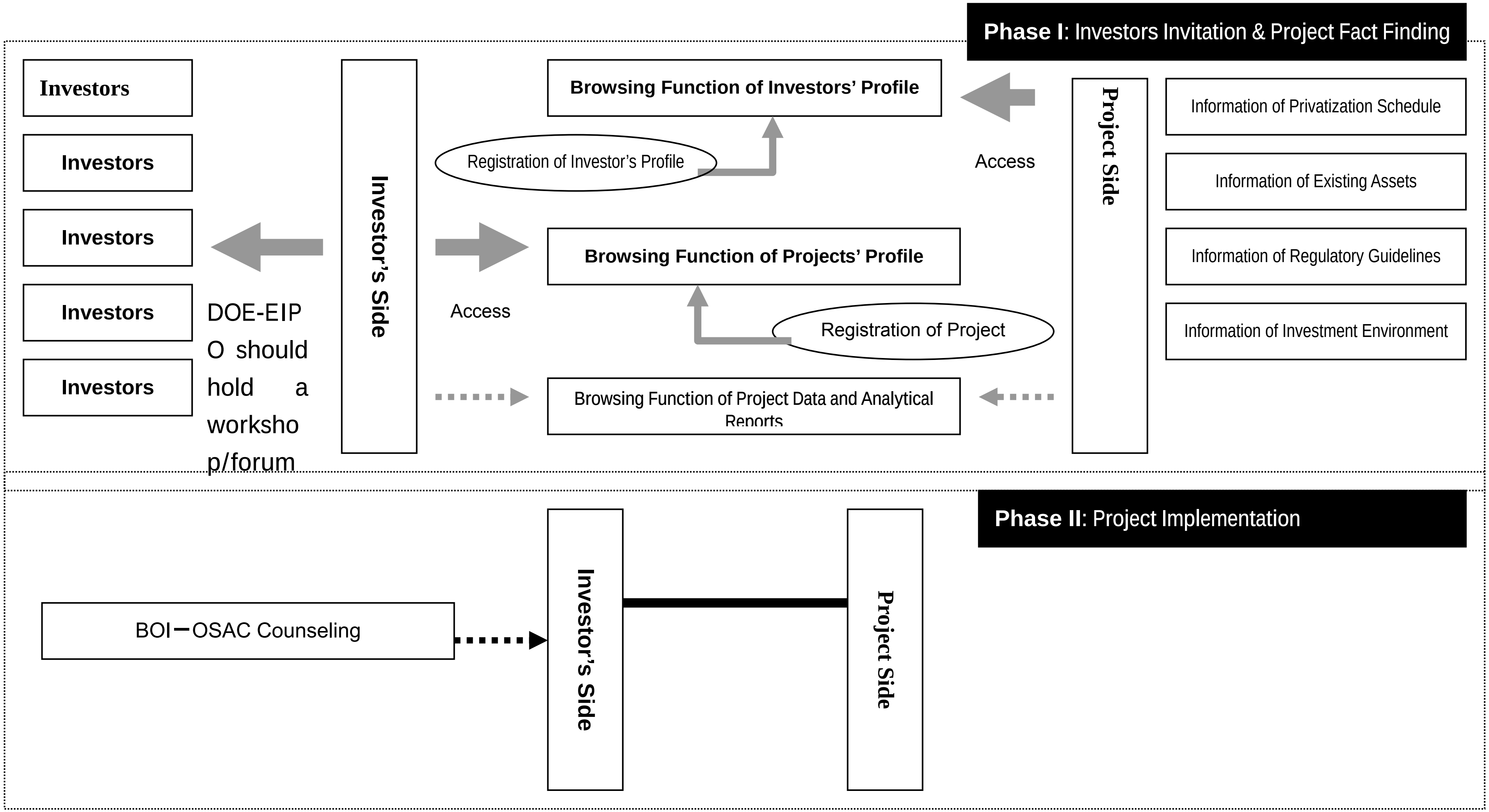


Figure 8.5 Framework of the Future Optimal EIPO System and its Contents

8.4.3 Case Study: NPC Asset Sales and EIPO System

As suggested in the previous project, Philippine power sector projects are classified into three categories, i.e., (1) investments in Build Operate Tranfer & Build Operate Own projects, (2) newly initiated private sector projects and (3) investments on former NPC's assets. Of these three categories, previous reports forecast that item (2) newly initiated private sector projects, with an OTC contract with a transmission company and merchant plant for pooled market, will be the main stream Philippine power sector project.

A private company that has an intention to enter the generation business needs permission from the Department of Environment and National Resources (DENR), and the local government. After receiving permission form the above agencies, the company develops project proposals under the DOE and ERC's supervision. Registration is made at the Securities Exchange Commission (SEC) and final project permission is given by the DTI. The application with the local government and the DENR was not well known to existing investors. Therefore, the EIPO should include contents, that few investors know, on the process and costs involved with project applications like the above. Information concerning preferential tax treatments granted by the BOI precedes the above application.

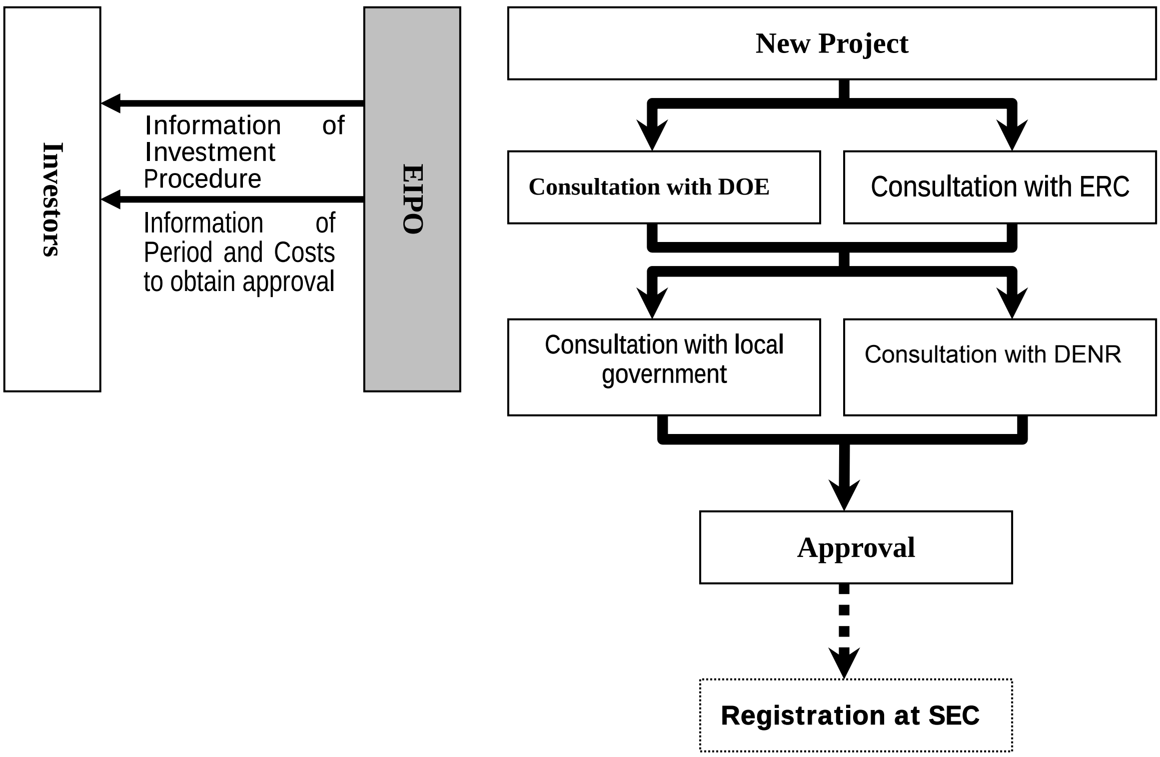


Figure 8.6 EIPO's Role as a consolidated infomediary in Power Sector Market

The series of interview surveys conducted in this follow-up project suggest that foreign investors always face uncertainties when they try to make business decisions in the Philippine power market. This is one of the major reasons why incoming power sector investment has shrunk in recent years. Therefore, the EIPO system must first of all enhance its website contents to deal with this asymmetric information problem.

Furthermore, the EIPO should strengthen not only the contents concerning the initial bureaucratic procedure, but also information on registration and preferential tax treatments. In addition, time and cost required from investors to apply with the DTI and the BOI are usually unclear. For instance, foreign investors with more than 40 percent ownership are treated differently from the others. Another example is when the investors of the Scarlet Power Generation, sold by the GENCO, was requested to establish SPCC.

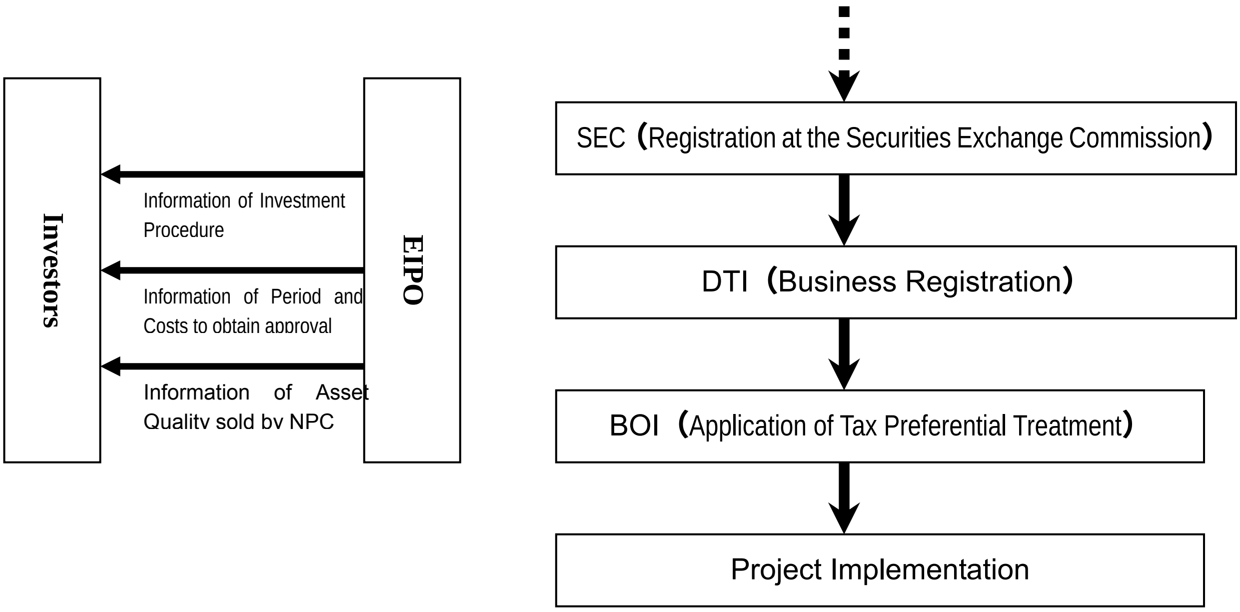


Figure 8.7 EIPO's Role as a consolidated infomediary in Power Sector Market II

8.5 Human Resource Development of EIPO

8.5.1 Recent Human Resource Development

The EIPO was formed in March 2003 with initial four staff coming from different units of the reorganized DOE. The staff members are the following:

- ・Lisa S. Go, Supervising Investment Specialist
- Lisa V. Pangilinan, Senior Investment Specialist
- Amparo A. Valera, Senior Investment Specialist
- Julieto O. Ariete, Generalist

The Supervising Investment Specialist, as head of the team, is fully in charge and responsible for the EIPO system.

The job assignments of the two Senior Investment Specialists are (1) EIPO website maintenance, (2) Data management, (3) Linkages with donor agencies, etc., (4) Development of investment kits and other info materials and (5) Assistance/promotion of the DOE major energy programs. The two Senior Investment Specialists are proficient in computer operations. Accordingly, they mainly cover the above EIPO website development and the Generalist coordinates with other sections of the DOE and other government agencies.

Based on the interviews and questionnaire surveys with the above members regarding the five EIPO's assignments, job assignment #3 that is establishing linkages with donor agencies and other industry participants is the most dynamic task being done every month.

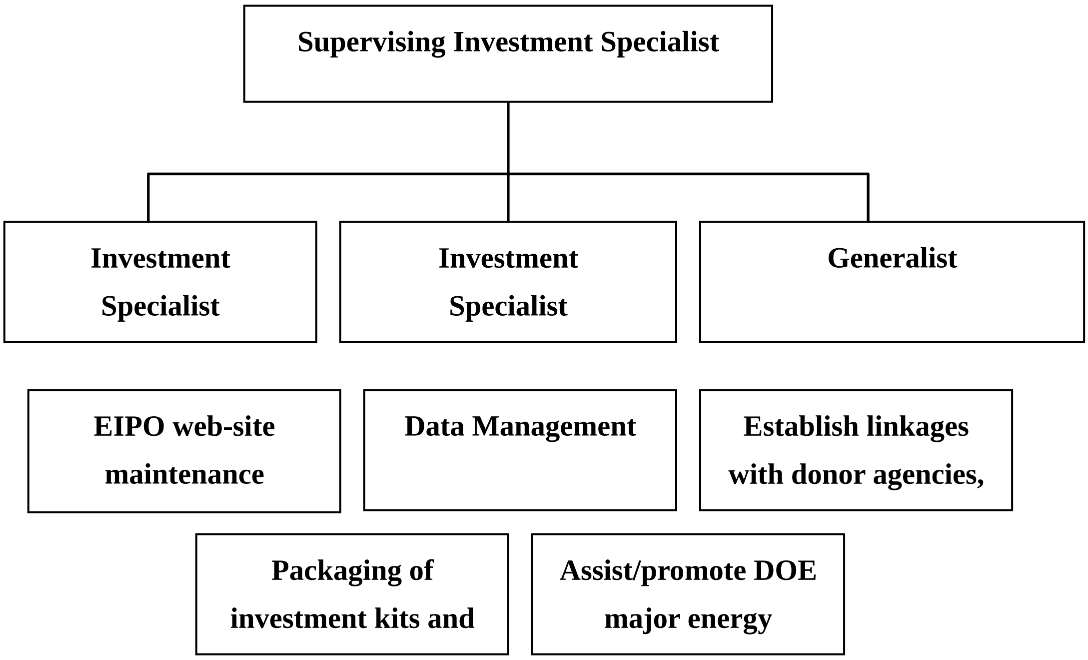


Figure 8.8 Organizational Structure of EIPO's Operation

8.5.2 Workflow Analysis

One of the conclusions of this follow-up mission is that the EIPO should enhance coordination with other DOE sections and government agencies. It is recognized that ERC and PSALM information are relevant to investors; as such the DOE should consider mechanisms to make available this information in the EIPO system or through links. This can be initiated through proper coordination with relevant agencies such asa ERC and PSALM. However, survey information gathered suggests that EIPO website data management accounts for more than 30 percent of the total workload of the two Senior Investment Specialists in May-July 2004. Therefore, future additional staffing of the Senior Investment Specialist is necessary to augment coordination with other DOE sections and government agencies.

As for strengthening relationship with investors, EIPO staff devote little time for this assignment. As noted above, supply-side enhancement will be achieved by coordination with other DOE sections and government agencies, but strengthening the demand-side investors will be very difficult to attain. Therefore, by holding forums with investors, the EIPO should generate more access points with investors, directionally resulting to an increase in the number of investor registrations.

Table 8.8 Result of Workflow Analysis of EIPO Members

1. Senior Investment Specialist 1

AFFAIRS(major division)		AFFAIRS(minor division)		AMOUNT	2004								Month			Months that One Process takes
No.		No.		(people*day)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	First	Mid	Late	
1	EIPO Website Maintenance															
		1-1	Review and improve the				0.0	8.3	6.7	5.1	6.9					
		1-2	Link up with the UNDP-				0.0	0.0	0.0	0.0	0.0					
		1-3	Promote the website				0.0	0.0	3.3	2.6	3.4					
		1-4	Respond to inquiries,				0.0	8.3	13.3	12.8	17.2					
		1-5	Others				0.0	0.0	0.0	0.0	0.0					
							0.0	16.7	23.3	20.5	27.6					
2	Data Management						0.0	0.0	0.0	0.0	0.0					
		2-1	Create a database of				10.0	8.3	13.3	10.3	13.8					
		2-2	Create a database of				10.0	8.3	13.3	10.3	13.8					
		2-3	Others				0.0	0.0	0.0	0.0	0.0					
		2-4														
							20.0	16.7	26.7	20.5	27.6					
3	Establish Linkages with Donor Agencies, Private Sector/Investment Association, Gos, etc.															
		3-1	Coordinate with BOI,				15.0	8.3	10.0	7.7	3.4					
		3-2	Conduct Conferences,				5.0	20.8	3.3	7.7	13.8					
		3-3														
		3-4														
		3-5														
		3-6														
		3-7														
		3-8														
							20.0	29.2	13.3	15.4	17.2					
4	Packaging of Investment kits and other Info Materials															
		4-1					30.0	12.5	16.7	25.6	0.0					
		4-2					0.0	0.0	0.0	0.0	10.3					
		4-3					0.0	0.0	0.0	0.0	0.0					
							30.0	12.5	16.7	25.6	10.3					
5	Assist/Promote DOE Major Energy Program															
		5-1	Power Development				10.0	8.3	10.0	7.7	3.4					
		5-2	Energy Resource				20.0	16.7	10.0	10.3	13.8					
		5-3	Others				0.0	0.0	0.0	0.0	0.0					
		5-4														
							30.0	25.0	20.0	17.9	17.2					

2. Senior Investment Specialist2

AFFAIRS(major division)		AFFAIRS(minor division)		AMOUNT	2004								Month			Months that One Process takes
No.		No.		(people*day)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	First	Mid	Late	
1	EIPO Website Maintenance															
		1-1	Review and improve the				0.0	10.0	8.0	6.9	6.9					
		1-2	Link up with the UNDP-				0.0	0.0	0.0	0.0	0.0					
		1-3	Promote the website				0.0	0.0	4.0	3.4	3.4					
		1-4	Respond to inquiries,				0.0	10.0	16.0	17.2	17.2					
		1-5	Others													
							0.0	20.0	28.0	27.6	27.6					
2	Data Management															
		2-1	Create a database of				10.0	10.0	16.0	13.8	13.8					
		2-2	Create a database of				10.0	10.0	16.0	13.8	13.8					
		2-3	Others													
		2-4														
							20.0	20.0	32.0	27.6	27.6					
3	Establish Linkages with Donor Agencies, Private Sector/Investment Association, Gos, etc.															
		3-1	Coordinate with BOI,				15.0	10.0	12.0	10.3	3.4					
		3-2	Conduct Conferences,				5.0	15.0	4.0	10.3	13.8					
		3-3														
		3-4														
		3-5														
		3-6														
		3-7														
		3-8														
							20.0	25.0	16.0	20.7	17.2					
4	Packaging of Investment kits and other Info Materials															
		4-1					30.0	15.0	0.0	0.0	0.0					
		4-2					0.0	0.0	0.0	0.0	10.3					
		4-3														
							30.0	15.0	0.0	0.0	10.3					
5	Assist/Promote DOE Major Energy Program															
		5-1	Power Development				10.0	10.0	12.0	10.3	3.4					
		5-2	Energy Resource				20.0	10.0	12.0	13.8	13.8					
		5-3	Others													
		5-4														
							30.0	20.0	24.0	24.1	17.2					

3. Generalist

AFFAIRS(major division)		AFFAIRS(minor division)		AMOUNT	2004								Month			Months that One Process takes
No.		No.		(people*day)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	First	Mid	Late	
1																
		1-1	Review and improve the				9.8	10.4	10.2	11.8	11.5					
	EIPO Website Maintenance	1-2	Link up with the UNDP-				0.0	0.0	0.0	0.0	0.0					
		1-3	Promote the website				4.9	4.2	6.1	5.9	7.7					
		1-4	Respond to inquiries,				9.8	10.4	10.2	9.8	9.6					
		1-5	Others													
							24.4	25.0	26.5	27.5	28.8					
2																
		2-1	Create a database of				9.8	10.4	10.2	9.8	9.6					
	Data Management	2-2	Create a database of				9.8	8.3	10.2	9.8	9.6					
		2-3	Others													
		2-4														
							19.5	18.8	20.4	19.6	19.2					
3																
		3-1	Coordinate with BOI,				9.8	10.4	10.2	9.8	9.6					
	Establish Linkages with Donor Agencies, Private Sector/Investment Association, Gos, etc.	3-2	Conduct Conferences,				9.8	10.4	8.2	9.8	9.6					
		3-3														
		3-4														
		3-5														
		3-6														
		3-7														
		3-8														
							19.5	20.8	18.4	19.6	19.2					
4																
	Packaging of Investment kits and other Info Materials	4-1					12.2	10.4	10.2	9.8	9.6					
		4-2														
		4-3														
							12.2	10.4	10.2	9.8	9.6					
5																
		5-1	Power Development				12.2	12.5	12.2	11.8	11.5					
	Assist/Promote DOE Major Energy Program	5-2	Energy Resource				12.2	12.5	12.2	11.8	11.5					
		5-3	Others													
		5-4														
							24.4	25.0	24.5	23.5	23.1					

8.6 Energy Investment Forum

8.6.1 Objective

As noted in the previous section, one of the key issues that the EIPO must address immediately is increasing the number of subscribers of the EIPO web-site. As of end of November 2004, 46 projects are registered in the site, but the investor' profiles uploaded are very few. To increase the number of investor subscriber, the EIPO held a forum titled "Energy Investment Forum" in cooperation with JICA team at Mandarin Oriental Hotel Manila on December 3, 2004 with 125 participants and/or investors.

8.6.2 Program

The program has three parts, namely, Session I: "Energy Sector Market and Investment Opportunity", Session II: "Energy Investment Opportunity", and Session III: "Energy Financing Facilities".

The Session 1 included presentations by Secretary Vincent. S. Perez of the DOE ("Overview on the Energy Situation and Investment Opportunities in the Philippines") and Comissioner Rauf A.Tan of ERC ("Energy Regulatory Environment"). President Lasse Holopainen of PEMC gave a presentation under Session 2. On the other hand,, three (3) presentations were delivered in Session III and these are by Mr. R. G. David of the Development Bank of the Philippines (DBP), Mr. J. G. Tirona of LGU Guarantee Corporation (LGUGC), and Mr. Vipul Bhagat of the International Finance Corporation (IFC).

8.6.3 Abstracts of Presentations

Session I

Overview on the Energy Situation and Investment Opportunities in the Philippines" Vincent S. Perez, Secretary of Department of Energy

In Secretary V. Perez's presentation, he explained the demand and supply forecast of the electricity market in 2005-2014. Along with the long-term forecast, he also explained the privatization schedule of the Philippine power sector in 2005-2014. The Secretary further advocated a new conceptual policy of the Philippine power sector structural reform titled "Energy Independence Package". Concretely, the package consists of the following five reform plans.

1. Increase reserves of indigenous oil and gas;
2. Aggressively develop renewable energy potential such as biomass, solar, wind and ocean resources;

3. Increase the use of alternative fuels;
4. Form strategic alliances with other contries; and
5. Strengthen and enhance energy efficiency and conservation programs.

At the end of his presentation, he encouraged the investor- participants to visit DOE and EIPO web-site..

Energy Regulatory Environment, Rauf A. Tan, Commissioner of ERC

Mr. R.A. Tan, Commissioner of ERC, first explained the purpose and background of the ERC's creation. He also added recent trends of ERC' regulation in the Philippine power sector. He emphasized the differences between the ERC and the former ERB and how the ERC became different since the enactment of EPIRA. He finally mentioned the introduction of the universal charge system and explained how it will influence future pricing policy.

Session II

Energy Investment Opportunities: Wholesale Electricity Spot Market (WESM), Lasse. A. Holopainen, President of the Philippine Electricity Market Corporation

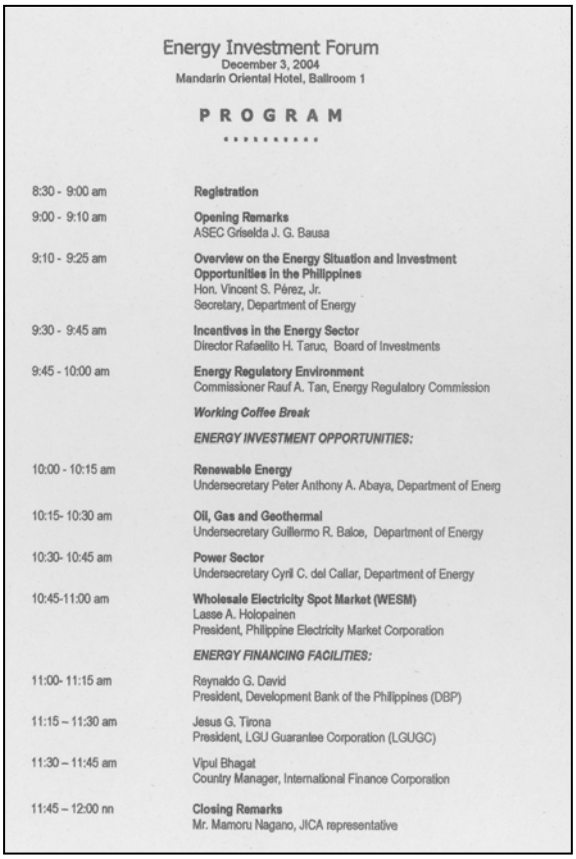
Pres. L.A. Holopainen provided an explanation regarding recent trends in the Philippine electricity wholesale market. He first mentioned the wholesale market trend after the EPIRA' enforcement and then presented the current status and structure of the market. His presentation helped participants and investors to understand the system of the newly deregulated market in the Philippines.

Session III

Energy Financing Facilities

Session III provided presentations regarding what public financial schemes are available for investors. The presentors from DBP, LGUGC and IFC explained their loan and investment portfolio, as well as opportunities for availment of their loan packages for the power sector market in the Philippines.

The DBP presentor emphasized that the bank has a variety of financial tools including two-step loan. Here, DBP speaker mentioned that international cooperation with governments in industrialized countries are necessary to prepare two step loans. LGU Gurantee Corp is not financial institution, but an organization that provides guarantee. Mr. Tirona noted that their loan guarantee policy related to the power sector is very important. Mr. Bhagat, on the other hand, explained histrical achievement of World Bank Group in power sector loan disbursement since the 1980s and they will continue to extend the loan in East Asia.



Energy Investment Forum
December 3, 2004
Mandarin Oriental Hotel, Ballroom 1

PROGRAM

8:30 - 9:00 am	**Registration**
9:00 - 9:10 am	**Opening Remarks** ASEC Griselda J. G. Bausa
9:10 - 9:25 am	**Overview on the Energy Situation and Investment Opportunities in the Philippines** Hon. Vincent S. Pérez, Jr. Secretary, Department of Energy
9:30 - 9:45 am	**Incentives in the Energy Sector** Director Rafaelito H. Taruc, Board of Investments
9:45 - 10:00 am	**Energy Regulatory Environment** Commissioner Rauf A. Tan, Energy Regulatory Commission
	Working Coffee Break
	ENERGY INVESTMENT OPPORTUNITIES:
10:00 - 10:15 am	**Renewable Energy** Undersecretary Peter Anthony A. Abaya, Department of Energ
10:15- 10:30 am	**Oil, Gas and Geothermal** Undersecretary Guillermo R. Balce, Department of Energy
10:30- 10:45 am	**Power Sector** Undersecretary Cyril C. del Callar, Department of Energy
10:45-11:00 am	**Wholesale Electricity Spot Market (WESM)** Lasse A. Holopainen President, Philippine Electricity Market Corporation
	ENERGY FINANCING FACILITIES:
11:00- 11:15 am	Reynaldo G. David President, Development Bank of the Philippines (DBP)
11:15 – 11:30 am	Jesus G. Tirona President, LGU Guarantee Corporation (LGUGC)
11:30 – 11:45 am	Vipul Bhagat Country Manager, International Finance Corporation
11:45 – 12:00 nn	**Closing Remarks** Mr. Mamoru Nagano, JICA representative

Figure8.9 Program of Energy Investment Forum held on December 3, 2004

Figure 8.10 Closing Remarks by Mr. Nagano, JICA Study Team

Figure 8.11 Presentation by Mr. V. Perez , Secretary

9. Institutional Strengthening of the DOE

9.1 Present Capability of DOE in Preparing the PDP

One of the main objectives of this study is to provide capability to DOE for the preparation of the PDP through appropriate capacity building activities. And because DOE has to prepare next year's PDP by themselves, it is very important to examine the present capability of DOE in the preparation of the PDP.

In order to determine the capability of DOE correctly, the study team implemented this follow-up study under the following strategies:

1) The study team will just support DOE in preparing the PDP, and will not prepare the PDP directly; and
2) The study team will answer questions from DOE and make appropriate comments instead.

Table 9.1 shows DOE's present capability in the preparation situation of PDP (2005-2014). This can be summarized as follows:

- DOE can now prepare the demand forecast and power supply plan;.
- TDP related issues may require many potential studies. The DOE cannot address all of them at the same time because of the present undermanned condition of DOE; and
- DOE can aggregate the DDP completely.

The following are recommended in order to update the PDP in the future:

- To augment the present manpower complement with dditional technical staff for the TDP;
- To establish the comment / advice system by experts in the demand forecast and power supply plan is highly suggested.

Table 9.1 DOE's Present Capability

Items	PDP(2005-2014) Preparation	Evaluation
Demand Forecasting	- DOE conducted the demand forecasting by themselves based on the aggregation of DDPs. - Demand forecasting based on the Macro-Econometric model was conducted by the DOE. However, data handling was conducted by JICA study team.	- Demand forecasting by DDPs aggregation can be conducted by the DOE certainly. - Demand forecasting based on the Macro-Econometric model can be conducted by the DOE. - DOE can be retrained on data handling by using the statistical software.
Power Supply Plan	- DOE revised the data of WASP-IV and simulated the Least Cost Power Development Plan. - Optimal siting of power plants was determined by the DOE by using the reserve margin as an index. - The study team assisted the DOE in confirming the optimal siting and power flow by using the GTMax.	- The DOE can simulate the Power Development Plan by using the WASP-IV. - The DOE can determine the optimal siting roughly by using the reserve margin as an index. - The DOE can handle the GTMax on the provided model. However, the results shall be validated by experts.
Evaluation of Transmission Development Plan	- Person in charge had to spend time to evaluate the transmission line project. As a result, he could not spend enough time to evaluate the TDP. - Given the proper focus, the DOE can technically evaluate the TDP, if the model of PSDS/E is shared by TRANSCO to the DOE	- Technically speaking, the DOE has the capability to evaluate the TDP. - However, the TDP-related studies are just too much to handle under the present under-manned situation of the DOE.
DDP Aggregation	- DOE conducted the aggregation of DDPs by themselves. - DOE requested to prepare the necessary form for DDP aggregation in the PDP management system.	- The DOE can handle the DDP and its aggregation. - Further application of DDP as data gathering tool for the PDP can be discussed and determined by the DOE.

9.2 Sustainable Capacity Building in DOE

9.2.1 Concept of Training System

The DOE will have acquired the necessary capacity for preparing the PDP at the end of this follow-up study. However, the institutional capability may deteriorate in the near future because of possible transfer or retirement of staff trained by the study team. To avoid such deterioration, and to improve such capability, sustainable capacity building within the DOE is necessary. Fig. 9.1 shows the concept of capacity building.

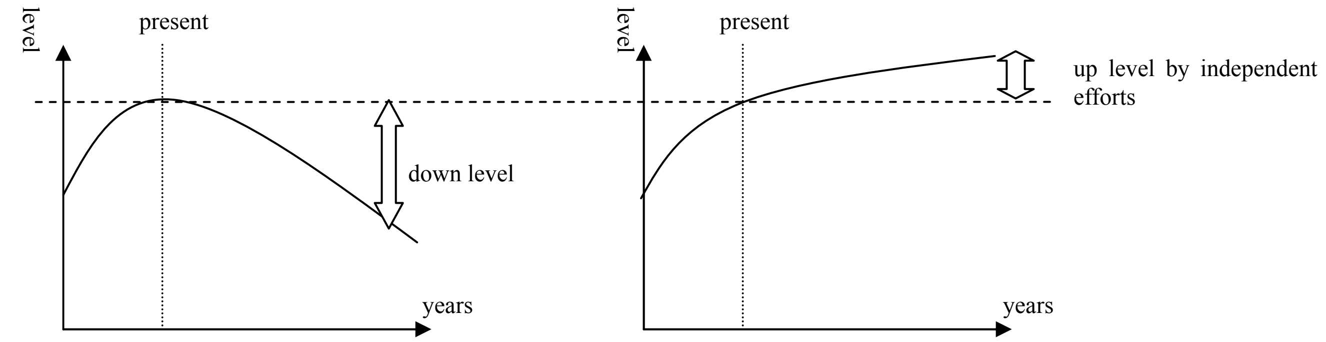


Figure 9.1 Effects of Sustainable Capacity Building in the DOE

9.2.2 Necessary Input to be Considered

In order to conduct the sustainable capacity building in DOE, the following inputs should be considered.

(1) Training Materials

The following materials should be secured:

- Manuals of simulation soft ware. Usually, the manual shows not only the way to handle it but also the methodology of calculation. This information should be understood.
- PDP Manuals Prepared by the Former JICA Study Team. This manual includes the TIPs not touched in the software's manual. Since this manual is written from the viewpoint of user / operator, the information covers the problems which beginners might encounter.
- General Documents / Technical Books. Since the methodology of demand forecasting and power development planning is classical, there are many technical books and documents in this field. These books may not be well known, but they are very useful and necessary to understand the fundamentals of the power development plan.

(2) On the Job Training in the Preparation of Power Development Plan

The DOE has to revise the PDP every year. Although the actual preparation work of the PDP provides precious opportunity for new comers / less-experienced staff to enhance their capability,, experienced staff members are likely to prepare the PDP from the viewpoint of preparation efficiency.

The planed OJT will provide the following results:

- The less-experienced staff can develop their capability through the conscientious work.

- The experienced staff can enrich their capability and transfer their knowhow through the OJT to the others.
- As a result, institutional capacity building can be achieved.

(3) Advice / Comment by Expert

As described earlier, DOE staff members already have the ability to somehow prepare the PDP by themselves. However, DOE can potentially face unknown issues with the introduction of the spot market, and has to address them. To solve these issues will likely be difficult for DOE because it requires much experience and expertise. Therefore, a system which allows to request recommendations and advices from experts is desirable.

9.3 Suggestions for Sustainable Capacity Building in the DOE

This section discusses the systematic capacity building in DOE as suggested in section 9.2.

9.3.1 Concept of Capacity Building

(1) Target Capacity

Table 9.2 shows the target capability for internal capacity building. Experience is required in preparing a proficient and responsive PDP Therefore, the target capacity is set as follows:

Table 9.2 Target Level of the Capacity Building

Activity	Necessary Input	Target Date
To provide the necessary assistance in the preparation of PDP	Assistance in PDP preparation at least one time plus self study using the relevant materials.	At the end of first year.
To prepare the PDP	PDP preparation at least one time plus self study by using the relevant materials.	At the end of second year.

(2) Fundamental Flow Chart for the Capacity Building

Fig 9.2 shows the Flow Chart to achieve the target level set above.

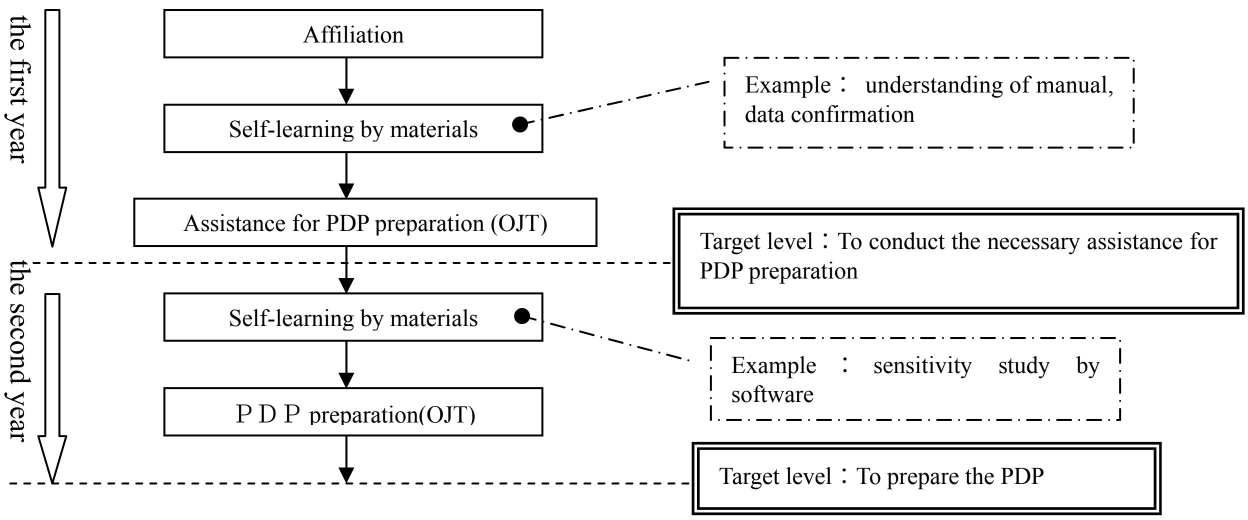


Figure 9.2 Flow Chart to achieve the target level

9.3.2 Program of Capacity Building for DOE

Fig. 9.3 shows the Capacity Building Program. The program consists of two parts, (1) the study using the materials and (2) the OJT conducted through the actual PDP preparation.

To maintain and then improve the technical level, the DOE should conduct the programmed capacity building by themselves.

(1) Skills to be acquired within one year

*Level A (Basic): Self-learning by materials
- Simulation software manual
- PDP Manual provided JICA study team
- Published engineering books

* Confirmation of the simulation data
- Data source of simulation software
- Ways to obtain the input data

* Trial operation of simulation software
- Trial operation on the demonstration data
- Trial operation on the last PDP's data
- Data confirmation

* Support work for PDP preparation (under OJT)
  - Data revise work
  - Preparation of related document

(2) Skills to be acquired within two years

*Level B (Application): Self-learning by materials
  - Materials and documents to be studied
  - Valid materials for sensitivity study

* Preparation of scenarios
  - Assumptions
  - Countermeasures

*Sensitivity study
  - Sensitivity study based on the prepared scenario

*PDP preparation (OJT)
  - Simulation run
  - Evaluation of the simulation output

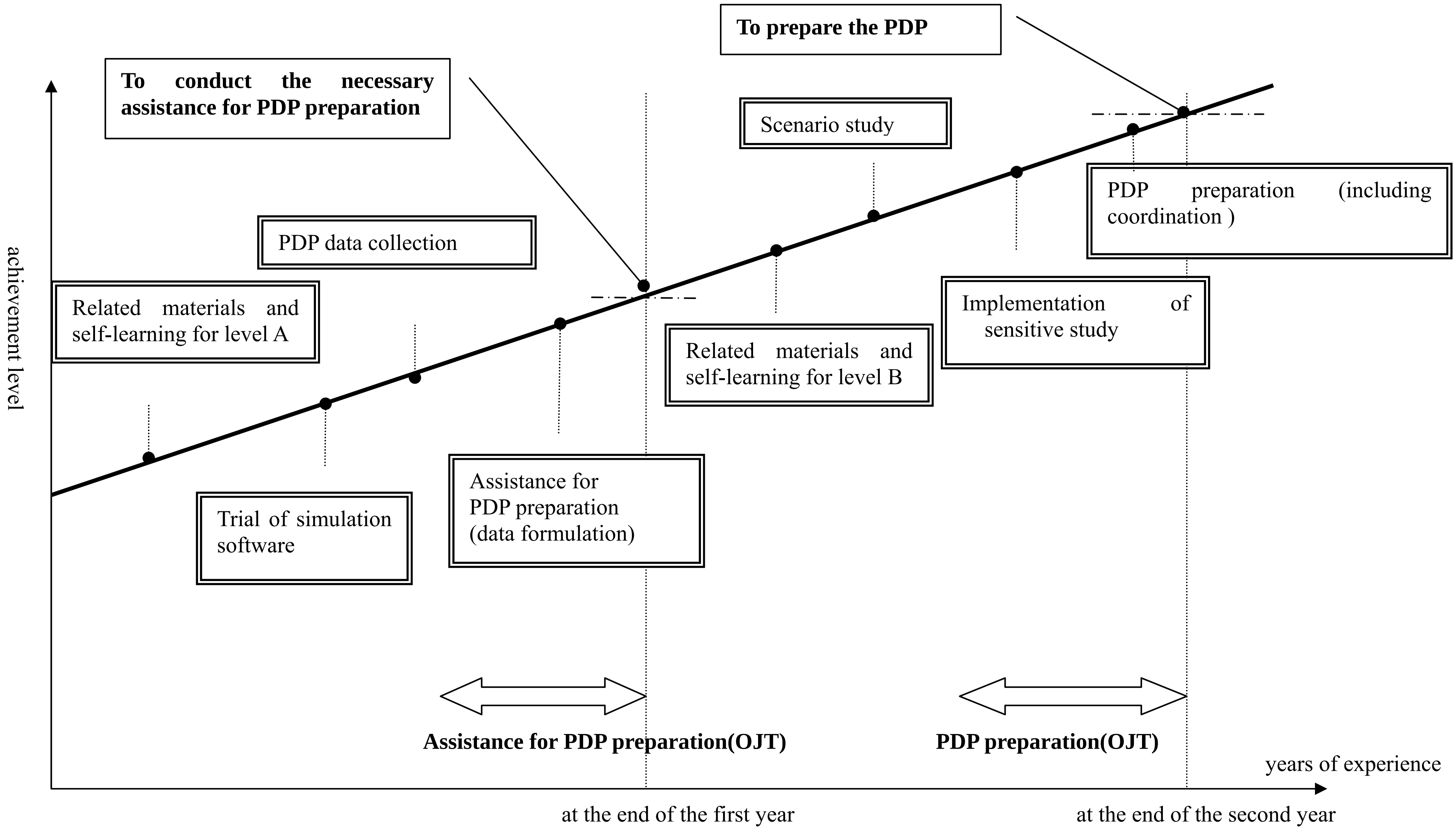


Figure9.3 Capacity Building Scheme

Table9.3 shows materials for the capacity building program.

Table9.3 Materials for capacity building program

Years of experience	Materials
First year	（General documents） - PDP Preparation Manual(JICA） - PDP Data Management System Manual(JICA) （Demand Forecasting） - STATISTICA Manual （Power Development Plan） - WASP-IV Manual - GTMax Manual （Transmission Development Plan) - PSS-E manual - Elements of Power System Analysis (Mc.Graw-Hill)
Second year	（Demand forecasting・Power development plan） - Least Cost Electric Utility Planning / Harry G. Stoll (John Wiley & Sons) (Power Development Plan） - WASP-III plus manual （Transmission Development Plan） - Power System Analysis / Hadi Saadat (Mcgraw-Hill)