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THE ESTABLISHMENT OF THE NATIONAL ENERGY INFORMATION CENTER IN THAILAND

Submitted to the
National Energy Administration
Ministry of Science, Technology and Energy

Under the
Renewable Nonconventional Energy Project
Royal Thai Government
U.S. Agency for International Development

—Thus I agree that the problem of information management is now a problem of filtering and refining a massive overload...We might well say that it is a problem not so much of data acquisition as of right storage; not so much of retrieval as of proper selection; not so much of selection as of identifying wants; not so much of knowing wants as of recognizing needs—and the needs are precisely the requirements of systematic equilibrium.

—Statement made by S. Beer in 1970 for the U.S. House of Representatives Committee on Science and Aeronautics, and quoted in *Data Handling for Science and Technology*, edited by S.A. Rossmassler and D.G. Watson. (New York: North-Holland/UNESCO/CODATA, 1980).

ACKNOWLEDGEMENTS

As with any project undertaken, it is the contribution of the people involved that determine the project's success. The contributions of the people listed here were instrumental in bringing to reality the establishment and success of the National Energy Information Center (NEIC).

From the National Energy Administration acknowledgements are made to Mr. Prapath Premmani, Secretary General, Mr. Tammachart Sirivadhanakul, Deputy Secretary General, Mr. Sompongse Chantavorapap, Project Manager and Miss Renoo Pogsomrite, Librarian. Dr. Maurice L. Albertson, Senior Technical Project Management Expert and Mrs. Lana Larsen, Editor, from the Office of Project Management Support are also recognized for their efforts in producing this report.

The United States Agency for International Development (USAID) must be mentioned for, without its support and financial assistance, the National Energy Information Center Project could not have been accomplished. The Department of Technical and Economic Coorporation (DTEC) is also acknowledged for its assistance in overseas procurement of equipment and for arranging participant training.

Acknowledgements are also made to Mrs. Mary Jane Ruhl for formulating the basic design of the project and to Mrs. Piyanart Sanguanmanee for assisting in the implementation of the project. Mrs. Samira Meghdessian is particularly acknowledged for her invaluable technical assistance and for writing this report.

Miss Nonglak Boonjawatn
Component Leader, NEIC
Energy Policy and Planning Division, NEA

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EXECUTIVE SUMMARY

The National Energy Information Center (NEIC) was established by a Cabinet decision on November 21, 1978, at the National Energy Administration, Bangkok, Thailand. It receives additional technical and financial support as one of fourteen components in a United States Agency for International Development (USAID) funded Renewable Nonconventional Energy Project (#493-0304).

The NEIC is a prototype energy information center for both the public and private sectors in Thailand. It was established with the following goals:

1. To serve as a comprehensive energy data center which collects, organizes, analyzes and disseminates energy information, particularly in renewable nonconventional sources in order to support integrated national energy planning.

2. To serve as a referral center for energy bibliographic and numerical data in Thailand, whereby information about past and ongoing research in all aspects of energy are available to users.

3. To provide this information regularly to users, in and out of the National Energy Administration (NEA), through a computer system and its varied forms of output, and through publications using selective dissemination of information processes based on user profiles.

4. To build a basic collection of books, serials, conference papers, microfiches and magnetic tapes and the like, on the local and international energy situation, which is organized according to recognized international standards.

The NEIC achieved these goals through the implementation of a basic plan that can be summarized as follows:

- Revision of the sources of energy information through interviews, correspondence with agencies, visits to energy centers, as well as acquiring and utilizing basic reference tools.

- Basic reorganization of existing library facilities to create a modern information center.

- Renovation of the NEA library to provide adequate facilities and attractive surroundings for users.

- Installation of a computer system and development and establishment of data processing activities and building data bases.

- Training of local staff on information systems.

- Issuance of publications to users in English and Thai.

The NEIC can now disseminate information on the development of renewable and indigenous energy sources as well as create an awareness of the importance of energy resources, their consumption and environmental considerations. By automating information, The NEIC is playing a leading role in collecting and disseminating information for use in the energy planning process on the national scale.

CONCLUSIONS

A. ORGANIZATION OF THE NEIC

- The NEIC was established by a Cabinet decision at the NEA in 1978. It serves as an energy information center in which all types of energy data, documents and reports are collected. This data was analyzed and used to formulate the Energy Master Plan. The NEIC is a prototype energy information center for both public and private sectors in Thailand. In addition, it serves as the energy information referral center for information exchanges among other agencies.

- In 1982 the NEA reorganized its divisions and the NEIC became a section of the Energy Policy and Planning Division. At present the NEIC includes the NEIC Project, the NEA library and the System Analysis section.

- The NEIC established an up-to-date energy library organized according to international standards, and which was referred to by users regularly.

- The computer system was installed in June 1984, therefore, data processing activities will be forthcoming.

- The NEIC library was renovated and equipped with new equipment and furniture.

B. STAFF AND TRAINING

- The NEIC civil servants were provided formal training on information systems in Bangkok and on Hewlett/Packard hardware in Singapore.

- The NEIC organized a software (MINISIS) training program with technical cooperation from the International Development and Research Center (IDRC) during June 24-July 13, 1984, at NEA for its staff and other interested institutions.

- The NEIC provided ongoing on-the-job training during 1982-1984 for all the staff.

- The NEIC is short of personnel because of frequent staff turnover.

C. DEVELOPMENT OF DATA ACTIVITIES-- BIBLIOGRAPHIC AND NUMERICAL

- A bibliographic data base in energy was established by NEIC, in an external computer system, comprising approximately 1,200 records.

- At the same time, 940 records were prepared for input, and 2,300 were selected for bibliographic documentation.

- After the installation of the mini-computer system in June 1984, the bibliographic data base using the MINISIS software was established.

- The NEIC documented procedures for bibliographic data and for numeric data processing.

- The NEIC is processing renewable energy data, NEA administrative records, meteorological and hydrological data.

- The NEIC developed a thesaurus of energy terms for the data base.

D. DEVELOPMENT OF LIBRARY ACTIVITIES

- The NEIC inventoried all the library collection and discarded peripheral material.

- The NEIC inventoried all the library procedures, flow-charted them and published them in a Library Procedures Manual.

- The NEIC established an up-to-date energy library in two languages-- English and Thai.

E. SERVICES AND PUBLICATIONS

- The NEIC offers some user services based on the library collection and some data base services from the bibliographic data base.

- Regular services and on-line searches will be offered by the NEIC computer system.

- Information services are provided for NEA Divisions from the numerical data base.

- The NEIC documented guidelines for readers on how to use the library.

Publications

- The NEIC issued a newsletter, bibliographies, and manuals, in Thai and in English. Some of these publications were produced on NEA premises, while others were printed by professional agencies.

- The NEIC printed at least 200 copies of each publication for distribution inside and outside of Thailand.

- The NEIC developed a mailing list of people and centers inside and outside Thailand who receive its publications.

- The NEIC surveyed energy centers in Thailand and ASEAN for the purpose of printing a directory of potential users.

- The NEIC published a brochure (in English and Thai) announcing its services and publications.

RECOMMENDATIONS

A. ORGANIZATION OF THE NEIC

- The NEIC should be unified in a single unit so that the user can easily locate all the information. The interrelation between the library and the computer center should be more clearly identified and the services offered to the users should be made more distinct.

- The library, though renovated, remains small. It may be able to accommodate growth in the collection, but not for more than two years. More spacious premises (of at least double the present ones -- 64 m^2--128m^2) will be needed in the future.

- The computer center is also small. Any contemplated expansion of the system must consider larger premises, particularly for accommodating the staff.

- In the future, NEIC needs stronger support in terms of budget and manpower; otherwise it will not have sufficient resources to handle the functions and services as planned.

B. STAFF AND TRAINING

- The staff are to be commended on the support that they gave to the NEIC Project. A recommendation is made that permanent status be provided in order to try to eliminate the frequent turnover of the staff.

• Managerial capabilities should be developed to coordinate the data base as a whole. Through the USAID Project, there was no time to implement the training of a data base manager. The NEIC has requested assistance from the United Nations Development Programme (UNDP) to provide this training for 1985-1986. For this reason, NEIC needs to follow-up this matter closely with UNDP, which in turn has exhibited willingness to provide support.

• Additional training for the NEIC staff should be provided to develop the numerical data base -- particularly in how to use data through the Energy Master Plan model. Such possibilities will need to be considered with the experts of IDRC and UNDP at a later date.

• The library does not have sufficient staff. It is recommended that two more qualified civil servants be employed to assist in building the bibliographic data base and in the production of publications.

• Translation from English into Thai is a daily occurrence at NEIC, particularly since energy information of any international significance is published in English; therefore, all NEIC staff need to be better versed in the English language.

C. DEVELOPMENT OF DATA ACTIVITIES
Bibliographic and Numerical

• The NEIC plan in 1982 had envisaged the preparation of 4-5,000 records in the bibliographic data base. That number was prepared but only 1,200 were input in EBIS at ESCAP. It is recommended that the tape be brought from ESCAP, integrated at NEIC and all records be input. This should be an ongoing process.

• As for the numerical data base, an expert in this field would be helpful. Although the NEIC officials have received initial training, they will still need expert guidance to utilize the new system to its maximum capabilities, and to see how it can be used to fulfill the needs of NEA, particularly in the issuance and publication of data. A manual outlining these procedures should be written. In the future, it is recommended that both the numeric and bibliographic data bases receive equal attention as far as data base management is concerned.

• With the installation of the new computer system at NEIC, a leading role for the NEIC should be encouraged and developed--that of a referral center for energy information in Thailand. A regional network for renewable energy information is being established in Manila, Philippines with UNESCO support and the Ministry of Science, Technology and Energy is the focal point for this network in Thailand. Thus, if NEIC is given the needed support and funds it could assume the role of handling energy information for Thailand.

• The NEIC should also widen its sources of information by subscribing to international energy information sources and data bases. Although these will require a large outlay of funds, the information they provide, particularly the statistical type, is worth the expenditure.

D. DEVELOPMENT OF LIBRARY ACTIVITIES

Additional staff should be employed in the library to assist the librarian in preparation of bibliographic data, producing publications and managing the library and reference services.

• The NEIC should continue to assume an active role in providing users with information regularly through the distribution of bibliographies, surveys and other publications.

E. SERVICES AND PUBLICATIONS

Services

The NEIC must begin to assume a more aggressive role in disseminating information. In order to assume this role the following should be considered.

• The NEIC should avoid becoming archival.

• The NEIC should search and determine the NEA information needs by regularly meeting with the NEA Divisions.

• The NEIC should be the only referral source for energy information in Thailand.

• The NEIC must maintain an up-to-date energy library with an emphasis on energy statistics.

• The NEIC must continously publicize these services in order to attract more users.

Publications

• The NEIC needs to continue the publications issued through Project assistance. It is recommended that additional personnel be assigned to this unit and an effort be made to have these publications professionally printed.

• The NEIC should continue the *NEIC NEWS* as a quarterly publication. Numerous positive responses were received concerning this newsletter. At least two staff members should be assigned to its production. An effort needs to be made to compare it with other NEA publications to determine its value and to avoid duplication. More original articles or features could be included along with surveys of Thai expertise in renewable energy sources.

• The library should continue issuing bibliographies from the data base on a regular basis. This should be done often, depending on how frequently the data base is updated.

• The NEIC should maintain contact with the ASEAN energy centers that were identified through the Directory, and should search for more centers to issue a supplement.

LIST OF ABBREVIATIONS

AIT	Asian Institute of Technology
ASEAN	Association of Southeast Asian Nations
CDS/ISIS	Computerized Documentation System/Integrated Set of Information Systems
EGAT	Electricity Generating Authority of Thailand
EBIS	ESCAP Bibliographic Information System
EMP	Energy Master Plan Model
EPPD	Energy Policy and Planning Division (National Energy Administration)
ESCAP	Economic and Social Commission for Asia and the Pacific
IDRC	International Development and Research Center (Canada)
ISBN	International Standard Book Number
ISSN	International Standard Serial Number
ISIS	Integrated Set of Information Systems
ISO	International Organization for Standardization
MINISIS	Integrated Set of Information Systems Software Developed for the Minicomputer Hewlett Packard 3000
NEA	National Energy Administration
NEIC	National Energy Information Center
NSO	National Statistical Office
PTT	Petroleum Authority of Thailand
RD	Regulatory Division (National Energy Administration)
RERIC	Renewable Energy Resources Information Center
SDI	Selective Dissemination of Information
USAID	United States Agency for International Development

Chapter 1

Introduction

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INTRODUCTION

This publication presents the major findings in the establishment of the National Energy Information Center (NEIC), an agency established to meet the needs of the Royal Thai Government in organizing, categorizing, analyzing and disseminating energy information, particularly in renewable and nonconventional sources. Since the NEIC is a prototype for such information centers in Thailand, this report can be used as a guide for the establishment of such centers in other developing countries.

At this point, it should be emphasized that the value of this report lies in its Annexes which can be utilized as guidelines to assist others in developing the same type of energy information center or to innovate further. The basic text of the report traces the development of the National Energy Information Center. Its value is also inseparable from that derived from the Annexes—they are concrete exhibits and samples of how the procedures planned were implemented.

A. THE PROJECT

The NEIC is one component of 14 separate components involved in the Nonconventional Renewable Energy Project #493-0304. Projects carried out include:

Industrial Biogas
Biomass Gasification
Charcoal Improvement
Energy Master Plan Support
Micro-Hydro Project
National Energy Information Center
Pyrolysis of Rice Husks
Regional Energy Centers
Solar Thermal Processes
Solar/Wind Assessment
Stove Improvement
Village Survey
Water Lifting Technology
Village Woodlots

This Project is jointly funded by the United States Agency for International Development (USAID) and the Royal Thai Government and implemented by the National Energy Administration (NEA). The responsibility of the National Energy Administration is to recommend to the Government of Thailand optimum policies, strategies and plans for development of an energy system in Thailand. The aims of the NEA are:

1. To procure and to establish energy works for the development of the country and for the welfare of the people.

2. To conduct research, inspections, surveys and gather data related to energy resources in order to contribute to the government's energy policy and planning program.

3. To secure, control, buy, sell, rent or terminate the sources of energy production and its transport or distribution systems.

4. To lay down regulations to ensure safety from hazards of energy resources.

5. To set up standards for the sale of energy.

6. To help in promoting the use of energy in various sectors in order to improve the economy.

7. To create benefits that may be derived from the exploitation of energy resources such as irrigation, flood prevention and water transport.

B. BACKGROUND

The National Energy Information Center (NEIC) was established by the decision of the Cabinet on 21 November 1978. Since then, the NEIC has begun its operation as a traditional collection/library distributed between the Regulatory Division (RD) and the existing NEA library (see organizational chart of NEA, Annex 1). As such it was an accumulation of engineering text-books, electrical safety standards, a few serial titles (received and kept for the most part by the Directors of the Divisions), and a considerable number of energy reports, numbering about 2-3,000--mostly outdated items in English and Thai. Both the RD collection and the NEA library were running on very limited budgets as far as information services went. Three staff members were in charge--a locally trained librarian, an assistant librarian and a temporary civil servant who held the title of Public Relations Officer.

In 1980, the NEA became a recipient of a four-year fund for the development of the Renewable Non-conventional Energy Project (#493-0304) from USAID which included the 14 components mentioned earlier.

Thus, a new dimension was given to the development and growth of the afore-mentioned collections—a slow but definite entrance into the world of specialized information centers.

In 1981, an expert in information systems, Ms. Mary Jane Ruhl, of the Information Management Inc., was contracted by USAID; she worked for a period of two months to review the existing needs, to lay down the principles behind establishing an energy information center and to outline the various procedures required to implement this in detail (see Annex II). In early 1982, several Project staff were recruited locally to implement the procedures and tasks outlined and to establish the information handling system. The following Table identifies the Project personnel.

NEIC Project Personnel

NAME	NATIONALITY	QUALIFICATION	DATE OF EMPLOYMENT WITH PROJECT	TITLE
Samira Meghdessian	Lebanese	M.L.S. + 14 years experience	April 1982	Library Systems Specialist
Piyanart Sanguanmanee	Thai	M.A. + 2 years library science (Library Science)	June 1982	Technical Information Specialist
Chulamanee Ke.vkungwal (Replaced in Feb. 1984 by Kornthikar Chullabrahm)	Thai	B.A. (English)	July 1983	Publications Officer
Oranut Mekavibul	Thai	B.A. (Library Science)	Nov. 1982	Librarian
Surachai Surin	Thai	Technical (Vocational Certificate)	Nov. 1982	Typist

Mr. Pongsa Pornchaiviseskul, an engineer from the Regulatory Division (RD) was assigned as component leader to plan and work with the Project personnel on the development of the NEIC.

Work, initially, took place in one room updating the collection, commencing contacts with the producers and publishers of energy information, and purchasing new materials: monographs, serials, papers, leaflets, microfilms, tapes and reports. The USAID conditions for executing the assigned funds stipulated that expenditures of grants should proceed according to the system already in existance within the Thai government. This meant the Project personnel must acquire approvals through bureaucratic channels which caused considerable delays, particularly in the process of the acquisition of new materials.

However, the aims were very clear from the beginning, and work commenced as planned in almost all aspects of the NEIC.

In September 1982, it was decided to combine the collection at the RD with that of the NEA library in order to eliminate any duplication of effort in the same organization. At the same time, some basic procedures were being established and implemented as follows: a) selection and acquisition of new materials, b) cataloguing and classification, c) abstracting and indexing functions, and d) weeding out of old and peripheral materials.

The NEIC, then, became a part of the Energy Policy and Planning Division (EPPD) which already possessed some computer support equipment linked to the National Statistical Office (NSO) for processing non-bibliographic data. So a new dimension was added—that of numerical records—and the NEIC sections became:

1. The library
2. The bibliographic data base
3. The non-bibliographic/numerical data base
4. Services and publications
5. Program Development Support

A new component leader was assigned, Miss Nonglak Boonjawatn, in September 1982, from the EPPD and was given the title of Head of the National Energy Information Center.

In November 1982, pending discussions and final concensus of the type of computer system to be acquired, and in an effort to immediately begin processing bibliographic data through a computer system, an informal agreement was made with the UN/Economic and Social Commission Asia and the Pacific (ESCAP) In this arrangement, NEIC energy bibliographic records would be input in the ESCAP Bibliographic Information System (EBIS). Several advantages were to be gained from this:

1. A bibliographic data base would be built immediately
2. Staff would be trained in data entry and retrieval basics
3. Time would be saved by not waiting around for an in-house system to be installed
4. ESCAP offered to do this free of charge
5. The full tape of records would be given back to NEIC whenever it was requested
6. Retrieval could be requested for users at any time
7. Other UN information systems could become available to NEIC, including EBIS
8. The International Development and Research Center, Ottawa, Canada (IDRC) had already accepted the compatibility of EBIS with MINISIS, the software designed by IDRC for use on the Hewlett/Packard 3000, and which NEIC opted for at a later date.

In the meantime, NEA was studying all possibilities for selecting a suitable computer system for NEIC, that not only would serve the purposes of the Project in the short run, but would also, in the long run, be utilized for other energy sources as the need arose.

In January 1983, two computer specialists—Mr. Michael Sherwood, Systems Analyst at the Renewable Energy Resources Information Center/Asian Institute of Technology, Bangkok, and Mr. Peter Hipson, Private Computer Systems Consultant, Theatho/Thailand, conducted a one-month study of the computer and information needs of NEA and NEIC and presented a report which recommended the purchase of a Hewlett/Packard 3000/40 Minicomputer, on which the MINISIS software package of IDRC,could be utilized to build a bibliographic data base of international standards (see Annex III). After several meetings and communications between the computer specialists,USAID and NEA officials, a concensus was finally reached. The equipment was installed in June 1984.

C. Purpose

The NEIC has been established with the following goals:

1. To serve as a comprehensive energy data center which will collect, organize, analyze and disseminate energy information, particularly in renewable and non-conventional sources.

2. To serve as a referral center for energy bibliographic and numerical data in Thailand, whereby an attempt will be made to centralize information about past and ongoing research in all aspects of energy, in both languages, Thai and English.

3. To provide this information regularly to the users, in and out of NEA, through a computer system and its varied forms of output, and through publications, using selective dissemination of information processes based on user profiles.

4. To build a basic collection of books, serials, conference papers, microfiches and magnetic tapes and the like, on the local and international energy situation, which will be organized according to recognized international standards.

5. To accomplish all the foregoing goals with the underlying concept that the Thailand energy situation is highly dependent on neighboring countries, within and outside of ASEAN, and on the fluctuations within the international energy scene.

D. SCOPE

The NEIC was established with the firm belief that a definite need for energy information,-particularly in renewable resources, their development, exploitation and uses in oil-importing countries—has been recognized on the national level. Therefore, it was decided that the NEIC would perform the following functions and provide the following services:

1. Collect up-to-date (not earlier than 1980) monographs and other materials in renewable energy resources, as follows:

Alternative energy resources
- Coal
- Nuclear power

Renewable energy resources
- Biomass energy
- Geothermal energy
- Hydro power
- Solar energy
- Wave and tidal energy
- Wind energy

Energy conservation and consumption

Energy policy and management

Energy supply and demand

Energy statistics on resources, consumption, supply and demand, etc.

Energy issues in Asean and Asian countries

Energy issues on the international scene

2. Develop and manage a data base of energy information that is user-oriented. Preparation of user profiles would be the basis for information retrieval, both within and outside NEA, both on-line and off-line, as well as the provision of traditional library services.

3. Establish relationship for the exchange of energy information with other similar centers in Bangkok, Thailand in particular, and in Asia and the world in general. This would result in the issuance of directories of energy centers.

4. Develop a mailing list of contacts and users who would receive publications of the Center, regularly.

5. Become a prototype for establishing energy information centers in Thailand by provision of guidance through the issuance of manuals, handbooks, thesaurii, bibliographies, and through the organizing and/or participating in workshops and short seminars.

E. SIGNIFICANCE

The establishment of the National Energy Information Center is significant not only for Thailand, but also to other countries in similar situations for the following reasons:

1. The NEIC is the first of its kind established on the national level in Thailand. Thus, it is a prototype for others to follow.

2. The NEIC collects and disseminates energy information for utilization in the planning process on the national scale.

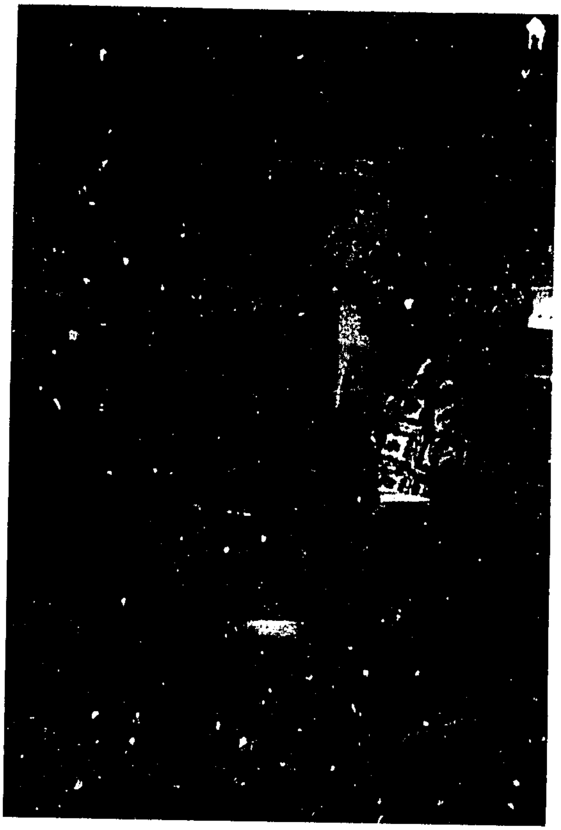
3. The NEIC collects and disseminates energy information from other energy centers in the country, thus, assuming a referral role.

4. The NEIC staff are trained sufficiently in energy information so that they will be able to provide guidance to others in the same field.

5. The basic aim of the NEIC is to create an awareness of the importance of energy resources, their consumption and their environmental considerations. In addition to this, the NEIC was created in order to emphasize the development of renewable and indigenous energy sources, in an effort to lessen dependence on imported fuels.

6. The NEIC generates publications that are distributed locally, regionally and internationally, in an attempt to maintain contact with other energy centers for purposes of exchange of needed information.

7. In automating energy information and having the equipment to do so, the National Energy Information Center can play a leading and centralizing role in collecting and disseminating data.



Training on use of serial records.

A staff member using the vertical file index. Also shown are the card catalogue and book stacks that were purchased with Project funds.

Chapter 2

Review of the Sources and the Literature

REVIEW OF THE SOURCES AND THE LITERATURE

At the outset when the NEIC was looking for the means and the tools to be established as an information center, the Project personnel decided first to consult with persons knowledgeable on the subject. This was done through personal interviews with concerned individuals, visits to other similar centers, correspondence with agencies dealing with energy information and with publishers of energy information, and through consultation and utilization of reference tools, guidebooks, handbooks and manuals that deal with the establishment of energy information centers and data bases.

This chapter will describe how personal interviews, correspondence, visits and reference tools assisted the NEIC and contributed to its establishment. Annex IV provides names of persons, addresses of agencies and titles of reference tools consulted and utilized in all the functions throughout the duration of the Project.

A. PERSONAL INTERVIEWS (see Annex IV-A)

The persons first interviewed (who are listed in Annex IV-A) were those who are directly connected with the planning of the NEIC Project. They included NEA and USAID officials. This was followed by meetings with information people in Bangkok who were either directors of similar centers or who were knowledgeable on the subject and who provided perspective and context for the NEIC. Others residing outside Thailand were consulted either as they passed through Bangkok or as the Project personnel met them when travelling outside Thailand.

B. CORRESPONDENCE (see Annex IV-B)

The second step was to try and locate persons, agencies and centers outside of Thailand, that could, if requested, provide guidelines, reference tools and names of additional persons and agencies to contact. There are numerous international agencies whose primary concern is to collect and provide information of this kind. Names and addresses are available in major library directories and tools, and are listed in Annex IV-B.

C. VISITS (see Annex IV-C)

Visits to observe similar information centers and other agencies in Bangkok were organized for the following reasons:

1. To introduce NEIC personnel and explain the purpose, scope and functions of the NEIC.

2. To identify the producers of energy information in Thailand and Asean, through visits to the embassies.

3. To investigate means for future exchange of information and promote cooperation between the NEIC and the agency visited.

4. To get *first-hand* experience concerning the function and services of the information centers. In this case the libraries of ESCAP and AIT were most beneficial.

D. REFERENCES USED IN ESTABLISHING THE LIBRARY (see Annex IV-D, E, F, G)

There are hundreds of these reference tools available internationally. Therefore, NEIC had to be selective. There exist handbooks and manuals for use by every kind of library and printed in many languages. Thai guides are also available. In addition to these, there are guidebooks and tools that must be utilized for every library function. Annex IV-D, E, F, G arranges these tools to be used by function and indicates which tools were found to be most useful in the establishment of the library.

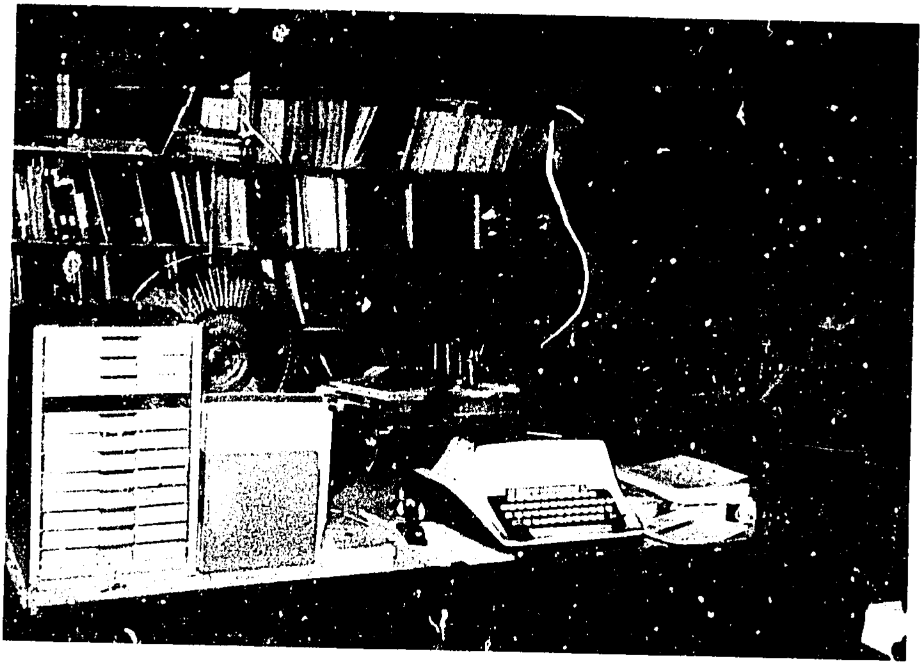
E. REFERENCES USED IN ESTABLISHING THE BIBLIOGRAPHIC DATA BASE (see Annex IV-H)

The correspondence received and references used in establishing the library eventually led NEIC to a basic list of references which became the main guides utilized in establishing a bibliographic data base. Since the data base was housed at ESCAP, it follows that tools utilized by EBIS were most heavily used. But since EBIS is not basically energy-oriented, its thesaurus was not consulted as often as those of the AIT/RERIC and the U.S. Department of Energy and the East-West Center in Hawaii. An NEIC mini-thesaurus was eventually the result. Annex IV-H lists these references. Starred titles are the ones found to be most useful by NEIC.

F. REFERENCES USED BY THE NUMERICAL DATA BASE (see Annex IV-I)

It must be mentioned here that a numerical data base did exist at NEA before the establishment of NEIC. Hence, tools for its original establishment are not mentioned, but rather those tools that are being utilized for the IBM support equipment are included. These are mainly programming manuals.

However after June 1984, with the installation of the mini-computer Hewlett Packard 3000/40, the hardware manuals and the MINISIS software manuals will be utilized by both the bibliographic and numeric data bases.



The NEIC Library before renovation.

The NEIC Library after renovation.

Chapter 3

Basic Design of the Project

BASIC DESIGN OF THE PROJECT

This chapter will discuss the original design and plan of work proposed to NEIC by USAID and the Project consultants. A chart is provide to illustrate the functions outlined and the flow of work expected to be implemented.

The budget allocated for implementation of all functions including the installation of the computer system and library renovation was $356,000, to be executed over a period of four years 1980-1984.

A. ORGANIZATION OF THE NEIC

As was originally planned by USAID in 1979, the NEIC or NEIDCT (National Energy Information and Documentation Center for Thailand) as it was called then, would be developed and implemerted during a four year period. The objective would be to establish a centralized source of information on energy for Thailand. Cenerally speaking, the responsibilities would include:

1. The collection, processing and publishing of accurate, complete and up-to-date statistics on energy.

2. The designing of a system to answer specific questions put forward by users in the private and public sectors.

These responsibilities would be assumed through the following functions:

a. Preparation of inventories and analysis of the need for data on energy and analysis of the available data sources

b. Acquisition and processing of relevant data and documents

c. Development of an appropriate coding system for registration of data sources

d. Development of computer programs for processing, storing and retrieving these data

e. Preparation and dissemination of publications and reports derived from the data and documents.

Specific tasks were planned as follows:

1. Planning and design of NEIDCT (later changed to NEIC)

2. Development of procedures and standards

3. Identification of resources and establishment of organizational relationships

4. Identification of users and their requirements

5. Selection of data resources

6. Acquisition and processing of data resources

7. Publications and services

From this original plan, the consultant Ms. Mary Jane Ruhl, who arrived in 1980 and 1981,derived and wrote down in more concrete and realistic terms, the needs of the NEIC (NEIDCT was changed to NEIC), procedures and/ or tasks to follow to reach the desired aims. The following chart Fig.1, which is the overview of NEIC as the consultant saw it, has two basic functions: Input/Resources leading to Output/Products and Services.

As it was conceived, the NEIC is divided into two basic physical entities: the library and the computer center.

The Energy Library

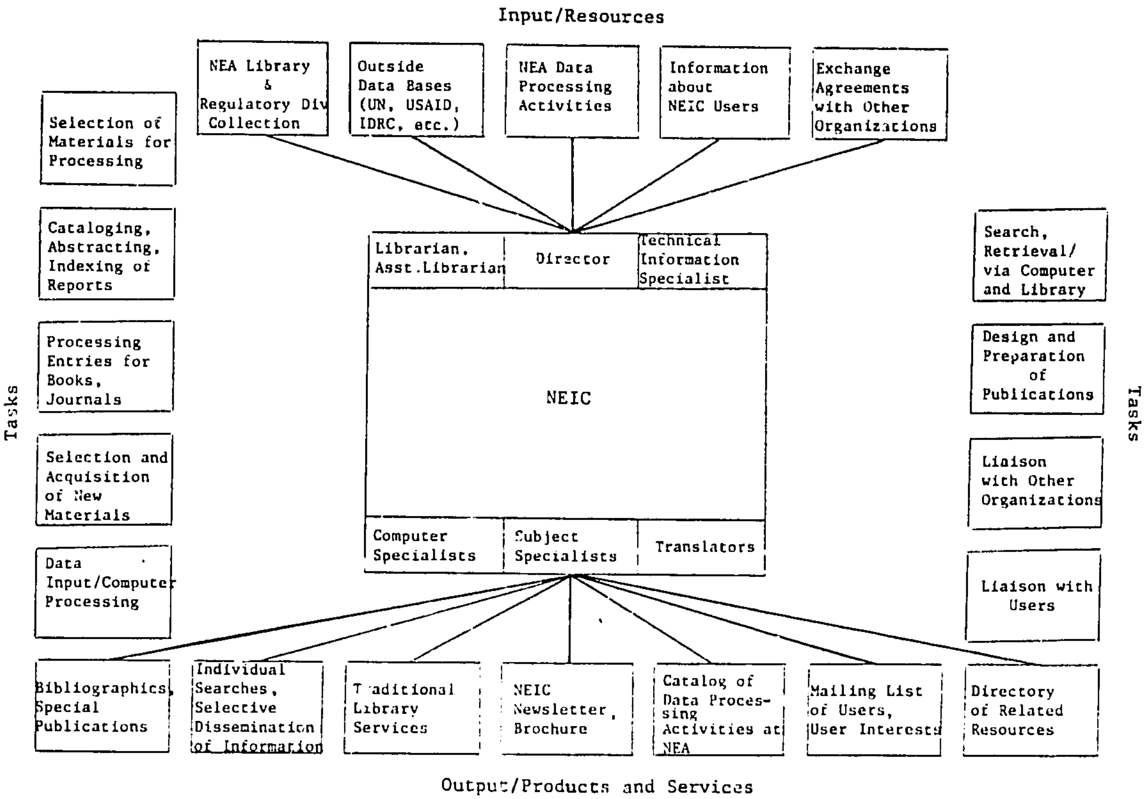
This entity was, is and probably will be what all those involved in planning the NEIC imagined it to be, i.e., the basic collection of energy materials located in some NEA Divisions, combined with that of the National Energy Administration (NEA) library to formulate the energy library. The energy data sources in the library are composed of: projects, feasibility studies, pamphlets, leaflets, company catalogs and their annual reports, conference proceedings and papers, electrical safety standards, monographs, textbooks, reference books and serials in both English and Thai. The library collection is housed in one room with a smaller room within the library that is used for typing, photocopying and microfiche reading services. Staff and readers use the same space.

The Computer Center

Serious consideration and study were begun for the type of hardware that would be most suitable for NEIC in 1981. Extensive field work and research into the availability of computer facilities in Bangkok resulted in the recommendation to utilize the National Statistical Office (NSO) computer, an IBM 3031 with remote capabilities. At the time, the Energy Policy and Planning Division (EPPD) had already requested approval for a terminal and printing equipment.

This equipment consisted of 2 card-punching machines, an IBM and UNIVAC and in 1981, and IBM 5285 and an IBM 5225 printer were added. In November 1983, a TOKYO/JUKI 2040 Data Recorder was purchased with two keyboards. All will be utilized through linkage with the NSO computer system. This being the case, the consultant Mary Jane Ruhl, recommended that the NEIC begin processing data through the NSO facility, with the option left open to consider other possibilities when additional hardware became available in

Fig. 1 OVERVIEW OF NEIC



Bangkok. All technical details concerning these options were explained in the consultant's report (see Ruhl, 1981). In April 1982, when the current Project personnel began implementation of the plan, and the NEIC became a part of the EPPD, it was evident that no bibliographic processing had been done on the energy data. However, after some investigation it was realized that this computer center which had linkage equipment to the NSO facility, was indeed processing numerical data as follows:

- Hydrological, meteorological data, that can be categorized as: flow data, sediment, gage heights, precipitation, evaporation, humidity, temperature, wind velocity, sunshine and solar radiation
- NEA personnel administrative and financial records

Requests and justification for the purchase of a stand-alone computer system had also been prepared by the consultant and by NEA. Proforma invoices from Unimesa Co., Ltd., as well as correspondence with IDRC for consideration of a Hewlett-Packard 3000/40 and the MINISIS software package were prepared late in 1981, but no firm decision had been taken to adopt this option until mid-1983.

Therefore in 1982, the situation could be described as follows:

1. There was no stand-alone system at NEIC.

2. Bibliographic data were not being processed.

3. Some numerical data were being processed but retrieval was not up-to-date for printing purposes.

4. Only linkage equipment to NSO existed at NEIC.

5. No data were processed from the Energy Master Plan (EMP) which is a model prepared for NEA on energy resources in Thailand, designed to assist NEA in energy planning and forecasting.

6. No energy statistics were processed.

B. STAFF AND TRAINING

As the NEIC staff situation stood in 1981, before the NEIC became a part of the EPPD, there were only three people employed— a component leader, a government official and one temporary official. The consultant had recommended the employment of 9-12 staff members (Project and government officials) in order to begin implementing the tasks of NEIC. By joining the EPPD, and in 1982, by employing Project personnel, the situation be described as follows.

Government Officials

There were 19 civil servants who were employed at NEA and who were assigned to work at NEIC. They could be categorized as permanent staff and temporary staff.

There were 14 government officials having permanent status in NEA. Table 3.1 indicates their position, level and number employed.

Table 3.1

Permanent staff at NEIC

Position	Level*	Number Employed
Systems Analyst	6	3**
Programmer	4 - 5	4
Librarian	4	1
Key Punchers	2	6

* Levels are based on Civil Service Commission Classification
** Of the three Systems Analysts, one is the component leader and another is the Data Base Manager

There were 5 temporary government officials employed by NEA. Table 3.2 indicates their positions and levels.

Table 3.2

Temporary staff at NEIC

Position	Level*	Number Employed
Programmer	3	2
Librarian	3	1
Librarian Assistant	3	1
Public Relations	3	1

* Levels are based on Civil Service Commission Classification

Project Personnel

The Project personnel were recruited locally to work the duration of the Project on the establishment of NEIC and to assist in training their government counterparts. In 1981, the recommendations included recruiting subject specialists, technical information specialists, librarians, a statistician, translator and clerical staff. Job descriptions were also prepared. In 1980, 5 Project personnel were employed, see Table 3.3. The contracts of these personnel expired with the end of the Project.

Table 3.3

Project Personnel at NEIC

Position	Educational Level	Number Employed	Nationality
Library Systems Specialist	M.L.S.	1	Lebanese
Technical Information Specialist	M.A.	1	Thai
Cataloguer	B.A.	1	Thai
Publication/Translation	B.A.	1	Thai
Typist	Technical Diploma	1	Thai

C. DEVELOPMENT OF DATA ACTIVITIES

Several tasks that were finally outlined for NEIC data activities, were later implemented to a certain degree, within the available means at the disposal of the Project personnel. These tasks were to inventory the existing data to search for sources of up-to-date data, to prepare the data for computer entry, to process the data via a computer system and then to retrieve the data.

Inventory of Existing Data

This first task involved the survey and inventory of all available data in the collections to determine: the nature of data being collected and utilized, the persons who were collecting the data, its up-datedness and whether the data collection should be continued or discontinued.

Sources of Up-to-date Data

Following the inventory which was to include weeding and disposing of out-of-date and peripheral energy materials, a search was to be done for sources and producers of up-to-date information inside and outside of Thailand. Valid research based on the needs of NEA was to be identified and located. Efforts were to be made to either purchase this information, photocopy it, microfilm it or, lacking all three, to document its existence for future referral.

Preparation of Input

Locating the necessary data and acquiring it, would then require the physical preparation for its input in a computer system. A data sheet was prepared based on the one used at AIT/RERIC for the CDS/ISIS software package (see Annex VIII-A). Sample bibliographic entries were prepared along with a bibliographic processing manual that was based on ISO standards 2709, outlining the steps to be taken to prepare the sheet. However, no attempt was made to identify NEIC numerical records, and no description was made for them in the processing manual written in 1981.

Processing Data via a Computer System

Taking into consideration the limitations existing at NEIC in staffing and equipment, the recommendation that NEIC should process its data through linkage with NSO was accepted with reservations. There were several reports pointing out the need for a stand-alone system at NEA due to the considerable volume of data available, as well as the inconvenience of communicating with agencies outside NEA. However, there was general consensus that the processing of the data should proceed through a computer system, whether inside or outside of NEA.

Retrieval of Data

This computer system (linked or independent) would be used to generate reports, statistics, annuals, bibliographies, on-the-spot analyses and projections based on the Energy Master Plan (EMP) data, and general dissemination of information as requested by NEA officials and other users.

D. DEVELOPMENT OF LIBRARY ACTIVITIES

The National Energy Administration (NEA) did not have an organized library. It had a collection of textbooks, reports, project reports and feasibility studies and a few serial titles that were subscribed to by individuals in the various NEA Divisions. These were housed in shelves under lock and key. There existed an accessions record with accession numbers and details pertaining to source, date of receipt and price included in ledger format. Yet this collection was used when needed, and new serials were being utilized by the officials. In October 1982, when this collection was placed in the NEA library, the characteristics of a properly organized library began to emerge.

Inventory of Library Holdings

A complete inventory of the existing holdings had to be carried out again, item by item, to consider the value and usefulness, source, up-datedness, who used it and whether it was worth keeping. This was to be done for both Thai and English collections. Priorities needed to be assigned as to which materials or energy information should be processed first for the base.

Selection and Acquisitions of New Materials

In up-dating the materials of the NEA/NEIC library, every effort was to be made to locate and select valuable energy information in whatever form it should appear. These materials can be categorized as follows:

Monographs, books or textbooks

These are one or multi-volume publications which are sources for energy information from a technological, economical, theoretical or statistical point of view. They can be written out as narrative, appear as conference proceedings or as reference books (i.e. have a logical arrangement to their contents; alphabetical, chronological etc.). Annex IV-F includes a list of publishers who issue such materials.

Serials or journals

In an energy library, serials comprise an up-to-date source of information for the simple reason that they are published in less time than books, and articles are usually the fastest and quickest way to report new research and new technology in printed form. These are issued periodically and in series and can cover a multitude of energy topics ranging from the most scientific to the most general. A list of energy serials subscribed to by NEIC is in Annex V. Usually, specialized publishers and/or research organizations, as well as institutes are engaged in publishing energy serials and journals.

Microforms - Microfiches and microfilms

Microforms are the result of the information explosion during the last decade. Their function is to miniaturize information on film so that it does not occupy extensive book or shelf space. These are excellent sources of energy information to acquire since they are inexpensive and light for airmail posting. Several energy publishers resort to them, rather than hard copies for transporting and exchanging information. Microforms require special euqipment for reading and printing, but under this Project that posed few problems. The NEIC planned to purchase a microfilmer (to produce these materials on the premises for NEA generated research) and a microfiche/

reader printer that allows the user to read the film by magnifying it, and to photocopy any page by simply pressing a button.

Magnetic tapes and diskettes

These are records of data bases, bibliographic and numerical, kept on magnetic tape and either prepared by NEIC for its own data base, or purchased commercially. Many will contain mathematical models for the various stages of energy planning at NEA, energy statistics for Thailand and ASEAN as time series, and information pertaining to reserves, supply and demand, and consumption patterns for the various industrial sectors.

A most essential element in selecting and acquiring packaged information from other data bases is compatibility of format for machine readability. Hardware exists for transforming tapes or diskettes to the desired formats, and should be considered when the computer system is purchased. A list of energy data bases and data base vendors is in Annex VI.

Other materials

These include pamphlets, leaflets, company reports and brochures, and standards. They can be requested freely, except for the standards of electrical safety. The NEIC subscribes to the *Standards from the International Electrotechnical Commission* (IEC) on an annual basis. All such materials are of value as they may contain information not available in monographs or serials.

Cataloguing and Classification

Internationally recognized standards should be used whenever possible in the organization of library materials. All materials will need to be organized. Monographs should be classified by number and subject. Shelving should be done by subject. Current serials will need to be exhibited by title. Each type of material should be organized to provide the user with easy access. *The Procedure Manual* (Annex VII) written in Thai, describes the organization of library materials in detail. The attachments of Annex IV include the manuals and guidelines for the organization of each kind of publication, as well as lists of tools and references that can be used in cataloguing and classification.

Indexing

This function involves the perusal of Thai journals and books to locate energy research in Thailand and to document it manually, by either recording the bibliographic data in Thai, on cards, or on lists for distribution.

From the beginning it was envisaged that the NEIC bibliographic data base should be formulated from an up-to-date energy library. For documenting energy research which is produced locally or abroad, a well-organized library will be the place where data processing begins for building a bibliographic data base. The logical methods in use by libraries in classifying information, and the tools available listing rules and regulations for bibliographic control are, in most cases, the first guide to be used whenever a data base is being planned. In addition to this, library staff who have already been cataloguing, classifying, analyzing and indexing information, are the only people who can be trained to build a bibliographic data base, and to perform the functions of abstracting and keywording.

Abstracting and Keywording

The amount of energy information published today in various forms makes it imperative for librarians and information people to extend the basic purpose of the library and to actually provide the users with the content of the information they need, and to make them aware of the available literature. Guidelines exist to show the correct way in formulating an abstract which can be brief and succinct and, at the same time, inform the user of the contents of a document.

As for keywording, this is the function of selecting descriptions that use the most suitable terms to describe a document or a record, and which later on can be utilized for retrieval purposes from the data base.

Building up a Thesaurus

A list of descriptors is called a thesaurus, if it includes Broader Term (BT) and Narrower Term (NT) relationships. If it is only an alphabetical list of terms, then it is called a word list. NEIC will need to formulate its own thesaurus, to which new descriptions can be added as needed.

Preparation of Data on Sheets

Primarily, the bibliographic description which was mentioned above and which includes the formation of abstracts and descriptors, is part of the preparation of data on input sheets. These sheets are used later for data entry. Software for bibliographic data bases usually gives instructions on the steps involved in completing a data sheet, and indicates the necessary fields that should be included. At the outset, for NEIC, several such sheets were prepared as samples, mostly based on the ISIS software. The AIT/RERIC data sheet followed. In any case, most bibliographic data sheets for monographs will carry the following fields: title, author, corporate body, meeting, publisher, date of publication, International Standard Book Number (ISBN), country code, language code, descriptors, abstract, call number and details of acquisitions and location. Serials may or may not have a different data sheet. Annex VIII includes *Brief Instruction for the NEIC Bibliographic Data Processing Functions*.

Processing of Data (via ISIS and linkage with NSO)

The bibliographic data which are prepared as explained previously, were planned to be input to the ISIS system at the National Statistical Office (NSO), and necessary bibliographies were to be generated as needed. A schedule for this processing was to be devised to satisfy the requirements of NEIC.

Eventually, NEIC was to have a terminal to input data on its own premises, but perhaps still linked to the NSO system. The recommendations for the use of ISIS at NSO were as follows:

INPUT - That NEIC should adopt the format used for the Asian Institute of Technology/Asian Geotechnical Engineering (AIT/AGE) information center, which can include keywords selected from a thesaurus as well as classification codes.

OUTPUT- That NEIC will require the following products from NSO:

1. Acquisition lists by author and title, on a monthly basis

2. Bibliographies of all acquisitions, including author (personal and corporate), keyword and country indexes

3. Selective bibliographies to be chosen through keywords or classification codes, and to be issued as needed

4. Selective retrieval in response to individual inquiries.

Any combination of fields should be able to be searched, and optional formatting capabilities are desired.

Identification of NEA and Non-NEA Users

Users from NEA in the various Divisions were to be identified, and questionnaires sent to them in order to determine their requirements from the data base at NEIC. The same were to be done for users outside NEA. Feedback from these users on the value of the information being disseminated to them is necessary for continuous scrutinization of the validity of the system. Contacts with international users were to be made through correspondence, in an effort to advertise the services of NEIC, and for information exchange. Eventually, a file of user profiles was to be input in the system, and selective dissemination of information was tc be generated automatically.

E. COMPUTER FACILITIES AT NEIC

This section will describe the computer facilities, hardware and software sources available at the time the basic Project design was made. The advantages of a stand-alone system for NEIC will also be discussed.

Original Idea of Linkage with NSO

Extensive investigation by the consultant in 1981 into the availability of computer facilities has resulted in the recommendation for NEIC to use the National Statistical Office (NSO) computer center. It was the only information retrieval system that was available in Bangkok within close proximity to the NEA. The NSO computer is an IBM 3031 with remote capabilities, and the NSO computer is a five-minute drive from NEIC. The request for terminal equipment to be used with the NSO computer was approved. This would allow the NEIC to be connected by only acquiring terminal and printing equipment. However, it should be emplasized that autonomy for input and output for NEA, was eventually the aim of the computer system. It has also been recommended that data management consultants should, at a later date, advise on computer applications other than those of CDS/ISIS, which was utilized by NSO and AIT, and at the first opportunity, the NEIC should consider a stand-alone system.

Other Options Available at the Time

At two separate intervals, recommendations were given to NEIC for consideration of an independent stand-alone computer system and its related hardware. One was in March 1981, and another was in January 1983. Although in 1981, detailed and extensive investigation went into the proposal of linkage with NSO, the preference was for leasing or acquiring a system exclusively for the use of NEA and NEIC for data processing activities. At this time, the only terminals available in Bangkok which were well-maintained by their manufacturers were those of IBM. However, at a later date (November 1981), more research and correspondence with the International Development and Research Center (IDRC) resulted in the recommendation that NEIC ought to consider the purchase of a minicomputer and the use of software other than CDS/ISIS. During the time the NSO was establishing its system and installing its hardware (1981), the time AIT was consolidating its utilization of this system, and the time (January 1983) when the computer consultants presented NEIC with their recommendations for the HP 3000/40 and MINISIS, several factors became apparent for NEIC which resulted in the purchase of a stand-alone system.

Pros of Purchasing Stand-Alone System

Although the Energy Policy and Planning Division (in which NEIC was incorporated in September 1982) did install an IBM 5285 programmable data station, which is linked through telephone lines with the NSO computer center, this was and is able to provide only a limited amount of the computer resources which the NEA requires. The problem with linkage with the NSO was that of time and provision of guidance in systems analysis. The output needed by NEA has to be provided immediately when requested by the energy planners, which NSO could not do. Added to this is the fact that NSO had only one systems analyst trained on the CDS/ISIS. The option of linkage with AIT's computer center was discussed at length by the computer consultants in their report in January 1983 (see Annex III).

Furthermore, the requirements of NEIC from a computer system were many. Among these requirements were the following:

1. That the computer system should provide on-line and on-site access to the computer-based data files.

2. That the computer system should provide access to the bibliographic files and related information. These files would include technical reports,

books, journals, project reports, standards, user profiles, energy centers, mailing lists, etc. The system would be searchable from various fields.

3. That the computer system should provide access to the Energy Master Plan data files which currently reside at AIT and are not directly accessable.

F. SERVICES AND PUBLICATIONS

From the original chart of the tasks that the NEIC is supposed to perform, it was clearly indicated that the issuance of publications and the provision of services, traditional or computerized, are two very important aspects of dissemination of energy information.

Services

As all information centers, the NEIC will be providing two types of services, which will be based on its major divisions. There will be traditional services issued by the library section and there will be automated services based on the computer center. Each section serves different clients.

Services from the library

Such services, which are well-known to most users, will include circulation of materials, reference services and current awareness services by photocopying title pages of serials and sending them to interested users. This will also include photocopying documents, microfiche reading and printing, as well as the filming of documents on microfiche for better storage.

Services from the data base

Services from this section depend on the capabilities of the hardware and the software utilized, and how much these can be programmed or re-programmed to perform. The computer system must provide on-line search and access to its files, as well as the capability of preparation of off-line citations which eventually can be used as bibliographies. These bibliographies can be distributed regularly to users, and can also be retrieved based on user profiles. In any case, the NEIC would require the following services from its data base:

- Statistical report issuance (NEA-generated)
- Individual querrying from the bibliographic and the numerical data base
- Selective dissemination of information
- Bibliographies
- Mailing list information
- Energy center information
- Energy Master Plan files
- Electrical Safety Standards

- NEA energy project description
- Internal management systems (could include NEA staff administration files, library management systems, procedures, etc.)

Publications - Description of Types and Purposes

The basic design of the NEIC Project mentions that the NEIC ought to issue certain publications that will be produced from the information system that is estalbished. At the time this was planned, it was assumed that the NEIC would have installed a computer system, and established a data base, thus making it easier to consider issuing such publications. The publications that were described in the basic study are:

The NEIC Newsletter

The NEIC newsletter was to be the journal or the voice of NEIC. It was to appear regularly and was to carry features of the activities of the Project in renewable energy sources in progress and planned activites of NEIC, news of new energy technologies or state-of-art reviews, energy information news, library news etc.

Brochure

The brochure was to be a leaflet describing the services of the NEIC in and effort to publicize its use.

Directory of Energy Centers

The *Directory of Energy Centers* was to be a listing of sources and centers that produce energy research of relevance to NEA.

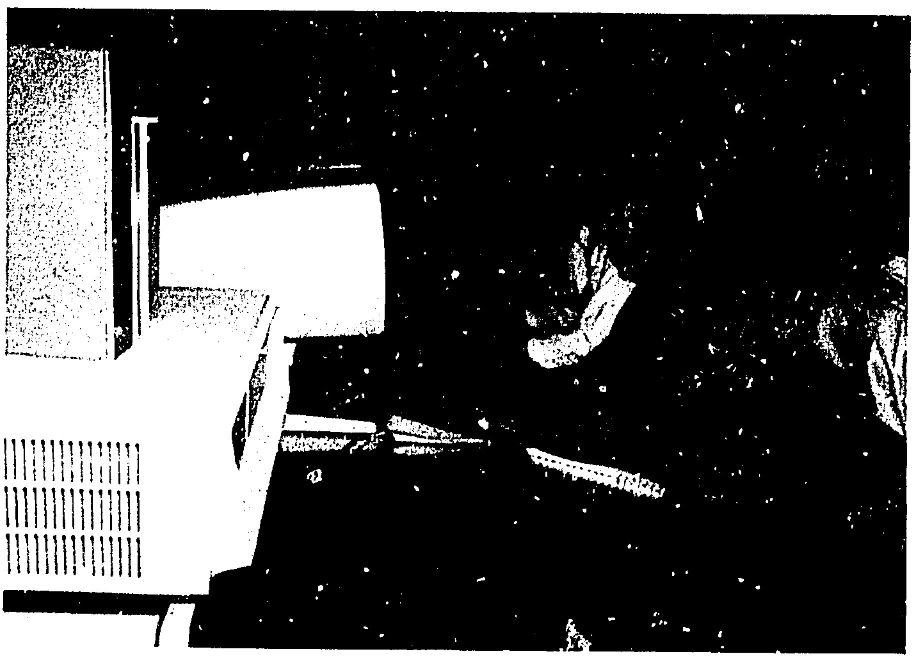
Data Processing Activities Manual (Including a Thesaurus

The *Data Processing Activities Manual* was partially prepared by the consultant Mary Jane Ruhl, in 1981. It was to be a step-by-step manual for the procedures that take place in preparing the data for input in a computer system. It was to include guidelines based on international standards and recognized practices. These practices were to include abstracting and keywording. As a result of this, a keyword list or thesaurus was also to be formulated.

Bibliographies - general and tailored

This would mean the issuance from the data base, of lists of selected sources based on a pre-arranged list of subject headings and user profiles. The NEIC could choose, depending on the needs and the demands at the time, to issue general bibliographies, or tailored ones, i.e., for particular users inside or outside of NEA.

Staff member cataloguing new materials received at the NEIC.



NEIC staff using Hewlett Packard terminals.

The Hewlett Packard minicomputer purchased with Project funds.

Staff member using Hewlett Packard magnetic tape drive.

Chapter 4

Procedures in the Establishment of the NEIC

PROCEDURES IN THE ESTABLISHMENT OF THE NEIC

This chapter will discuss the procedures devised and later implemented in the establishment and functioning of the NEIC. It must be noted, however, that such implementation was not possible before April 1982. This was the date when the recruited Project personnel began their work. Therefore, one must keep in mind that, whereas the Project as a whole was assigned four years for implementation, the NEIC component had only two functioning years, 1982-1984. Hence, the long-range plans that were made before implementation, were optimistic in several respects-particularly when it came to computerization and establishment of the data bases.

The techniques and procedures which were outlined in Chapter 3 will be discussed here in Chapter 4. Briefly this will involve: a) how the functions of the library and the computer center were established, b) how new procedures were developed and implemented, and c) how the staff were trained. This chapter will lso discuss in some detail, the data bases, the development of services and the issuance of publications.

A. ORGANIZATION OF THE NEIC

The NEIC is divided into two basic physical units--the NEA library and the computer center.

The Library

Between April and September 1982, the collection of energy materials kept in the Regulatory Division (RD) was designated to be the beginning of the NEIC. Various attempts were made to locate better premises to begin organization of the energy collection until September 1982, when a reorganization of the Division at NEA made it possible to integrate this collection with that of the NEA Library.

The NEA library facilities were inadequate for a modern information center. The holdings were also inadequate and often out-of-date. It became necessary to draw plans for the renovation of the library in order to make it more attractive to users and more conducive for research. Several plans were prepared until one was approved for implementation by the NEA. A copy of the approved plan is in Annex IX. Final implementation of the plan took place in April and May 1984. Annex X lists budgetary estimates for funds used for renovation, as well as in the preparation of the site for the computer, including purchase and installation of the computer.

Up until the time when moving took place, the consultant, two staff members and the component leader had several meetings to document the basic procedures and to begin implementation. These procedures were non-existant particularly those that were related to the ordering of materials and the settlement of invoices. The basic procedures were divided among the four people who were working at the NEIC at the time. These procedures included: a) obtaining approvals for the release of funds, b) contacting sources of energy information and c) surveying existing energy materials.

Approvals for the release of funds

Obtaining approvals for the release of funds was done by the component leader. This entailed filling out forms to have the release of advance funds from USAID in order to begin acquisition of materials and equipment. Following USAID approvals, any purchases had to again be approved by the proper channels in the National Energy Administration (NEA). As this process was time consuming, no funds were actually made available before September/October of 1982.

First contacts to obtain sources of energy information

First contacts to obtain sources of energy information were done by the consultant. They involved locating the energy publishers and sources of energy research, regionally and internationally, to begin making lists for up-dating the collection. Monographs and serials were accumulated first. Basic tools and references, that can be used for selection, were lacking, such as publishers, catalogs, books-in-print lists, lists of energy research from private and public agencies, dictionaries, handbooks, manuals etc. (see Annex IV-D). These agencies were contacted and the available and current lists which they sent provided a beginning for the NEIC.

Preliminary survey of existing energy materials

The preliminary survey of existing energy materials was done by staff members of the Division, as well as by the NEA librarian who helped on a part-time basis. This meant clearing the shelves and sifting through every item to judge its value. It also entailed documenting those materials that were deemed relevant according to international standards.

The Computer Canter

As was explained previously in Chapter 3, a computer center did exist at NEA, but in April 1982, its functions and those of the library were far apart, mainly because each was in a different location, and no unifying elements were being initiated as yet.

Description of the equipment available and its use

As the original plan for this center was to link with the IBM mainframe computer at the National Statistical Office (NSO), the linkage equipment that was available could be described as follows:

- *An IBM 5285 terminal and an IBM 5225 Line printer*
- *An IBM and a UNIVAC card-punching machines*
- *A Data Recorder with two keyboards (Tokyo JUKI 2040)*

Some of the applications which the NEA is currently running at the Center include:

- *Electric power transmission analysis*
- *Analysis of water flow*
- *Petrol usage analysis*
- *Hydrology*
- *Project analysis and evaluation*

This Center was not involved in processing any bibliographic data, simply because none was prepared. Two factors took place which changed the character and functions of this Center: the first took place in October 1982, when the NEA library became the NEIC library, and hence was expected to begin processing bibliographic data through the computer center to build a data base. The second factor took place January 1983, when it was decided that the MINISIS software package be adopted and the Hewlett Packard 3000/40 would be purchased for the computer center. It should be noted, however, that such equipment was not installed at NEIC until June 1984.

B. STAFF AND TRAINING

Chapter 3 describes the actual situation that exists today as far as staffing of NEIC goes. No new staff were recruited for the computer center, nor for the library. In both staff situations, in the library and at the computer center, the same problem existed—to prepare the staff for the transformation of the existing facilities into a modern information center that is capable of providing up-to-date and relevant data, as needed for the energy planning processes at NEA.

Government staff

Government officials of the NEIC were classed as either permanent or temporary employees--a fact which had an effect on the implementation of some of the procedures as well as initiative and continuity. Nevertheless, a search for appropriate training for all was initiated.

Only permanent government staff were eligible for any training programs that were officially organized with the participation of other agencies. This meant that in the library situation, only the librarian could be trained, and in the computer center, although several staff members were eligible, only a few could be released from their daily functions to attend training seminars.

Faced with the optimistic long-range plan for the NEIC and with the time limitation of the Project, the Project personnel trained the staff that were available. Three types of training were envisaged and applied:

1. On-the-job training which was organized by Project consultants and included training for all staff.

2. Short seminars and workshops, organized in conjunction with external agencies.

3. Attendance of conferences that were relevant for NEIC, and from which new techniques could be acquired.

Attendance of seminars, workshops and conferences is strictly controlled and coordinated by one agency in Thailand, the Department of Technical and Economic Cooperation (DTEC).

The following section will describe each type of training in some detail.

On-the-job training

This type of training was continuous throughout the duration of the Project. It involved all the library staff and one staff member from the computer center. It included the establishment of procedures for every function in the library, from the selection of materials to entry of a record in the computer system and retrieving it.

Short seminars and workshops organized in conjuntion with external agencies

Lacking the computer facilities at NEIC which would act as a training laboratory for the staff, the Project consultant searched for Centers that could handle this type of training. It was deemed necessary that the staff be exposed to information centers that were already well established and functioning, in order to give them a clear view of what would be expected of NEIC in the future.

As an introduction, two short one-day seminars were organized in 1982, at the Asian Institute of Technology/Renewable Energy Resources Information Center (AIT/RERIC) and at the Economic Commission for Asia and the Pacific (ESCAP) Library. Both seminars were of an introductory nature and had computerized systems which showed the staff how information systems function, from beginning to end-use.

The first seminar was conducted by Mr. Michael Sherwood, Systems analyst at AIT/RERIC. He and his staff demonstrated the capabilities of the system which utilizes the CDS/ISIS software package. The dissemination of information, packaging of information, printing and the preparation of data bases were explained.

The second seminar was conducted by Mr. Ingolf Walther, Systems Analyst at ESCAP Library and initiator of the ESCAP Bibliographic Information System (EBIS). The concept and details of EBIS were explained to the NEIC staff. This seminar,conducted in December 1982, paved the way for sharing and actual participation in EBIS. One NEIC staff member was trained by ESCAP library on data entry. By December 1983, approximately 1,000 records were entered in EBIS.

In January 1984, an important visit was made to the National Inland Fisheries Institute (NIFI) at Kasetsart University. NIFI had installed a Hewlett/Packard system 3000/40 in February 1983 and was running the MINISIS software package but only on data prepared by the Food and Agriculture Organization (FAO/ROME). In any case, the system was demonstrated to the NEIC staff. This was an introduction to the system the NEIC had selected.

In addition, a one-month program was arranged with AIT titled *Information Consolidation and Dissemination and CDS/ISIS Training Course* during the period February 20 until April 6th, including specialized training on computer systems. Four staff members attended this program: two were trained on the bibliographic data base, and two were trained on the development of the total information systems in general, and with the NEIC data bases in particular. Following this training, a training program on the hardware equipment also took place. This involved sending two staff members from the computer center to Singapore for a period of five days in March 1984, at the Systems Engineering Center (6th floor, Inchcape House, 450-452 Alexander Road, Singapore 0511).

The Program included three courses:

1. Programmer's Introduction (No. 22801B)

2. Systems Management (No. 22802C)

3. SPL/File System Introduction (No. 22804A).

After installation of the computer system, the training for the utilization of the MINISIS software package took place. The International Development and Research Center (IDRC) which is a semi-independent Canadian agency has developed MINISIS from the CDS/ISIS to be used on minicomputers—particularly the Hewlett Packard series 3000, instead of large main-frames. The same capabilities were possible with affordable prices and with an emphasis on *user-friendliness*. IDRC provides the package and the training free of charge for those who purchase the hardware. The training was scheduled for 3 weeks (June 24-July 11, 1984) and about 10-12 people were trained.

The last training program, which was prepared partially but did not take place due to lack of time, was that of training one systems analyst to become the Data Base Manager. Selected Centers which handle bibliographic as well as numerical energy data, were researched and listed. All are in the Washington, D.C. area.

Attendance of conferences

Two staff members from the computer center attended two conferences. The first conference was the *CODATA-UNESCO Training Course on Non-bibliographic Data Banks* at the Royal Institute of Technology Library, Sweden, Stockholm, October 15-22, 1983. The second conference was the *UNESCO/TECHNONET/PNOC-ERIC Training Seminar/Workshop on Information Analysis and Repackaging on New and Renewable Sources of Energy* at the Philippines National Oil Company - Energy Research and Development Center (PNOC-ERDC) in Manila, Philippines, January 24-February 9, 1984.

Project Personnel

It was not an easy task trying to locate Project personnel who possessed the desired qualifications outlined by the consultant. The staff listed in Chapter 3 indicate the type of personnel that became available from April 1982 to June 1984. One note should be added here--the turnover within the Project was considerable and unavoidable, due to the fact that the staff were looking for more permanent jobs, and did not want to face the prospect of joblessness in June 1984 when this Project was to end. The Project personnel worked very closely with the component leader and the librarian in outlining detailed procedures for every function of NEIC. For many functions, there were no procedures, and these had to be documented. The *Library Procedures Manual* in Annex VII outlines these procedures in detail in flow-chart format. The *Manual* is written in Thai because the staff who will be referring to it will be Thai nationals.

C. DEVELOPMENT OF DATA ACTIVITIES

All Divisions of NEA are involved in data collection and processing, whether manually or through automated means. All the Divisions collect numerical data except the NEA library, which collects and processes bibliographic data. Hence it is concluded that the NEA is primarily interested in building numeric data bases that will support the energy planning process.

Inventory of Existing Data

The following section will discuss the type of data collected by the NEA Division--numeric and bibliographic. The procedures that are applied in processing this data will also be discussed.

Numeric data and their sources

Data collection is performed by several Divisions at NEA. To locate and identify the processes involved, the only contact the Project personnel had was through the computer center, which in turn only received the data and processed them (through linkage with NSO), and then handed them back to the concerned Division for interpretation. As such, numeric data were received from the Energy Economics Division, the Energy Investigation Division, the Energy Policy & Planning Division, and the Renewable Nonconventional Energy Project.

The data from the Energy Economics Division are mainly Thai consumption patterns for oil, electricity and other energy sources that are issued in three annuals. For national energy policy making these data can be categorized as primary data and secondary data.

Primary data are information on domestic and industrial energy consumption including energy conservation. The collection is done through sampling. Surveys should be done regularly because the patterns of energy utilization shift rapidly. Three sources provide secondary data: a) the government sector, b) the industrial sector and c) the oil companies. Questionnaires are used to collect information.

The data from the Energy Investigation Division are used in water resource development and are categorized as: flow data, sediment data, gage heights, precipitation, evaporation, humidity, temperature, wind velocity, sunshine and solar radiation data. A hard covered annual report is produced on a regular basis and distributed upon request to more than 40 institutions within and outside Thailand. The computer center also processed data for an up-to-date annual on renewable nonconventional energy for the same Division. The annual has been published under the title *Renewable Nonconventional Energy Data 1983* (Renewable Nonconventional Energy Investigation Section, Energy Investigation Division). The data from the Energy Policy and Planning Division are included in an energy planning model which was prepared for Thailand. Several attempts were made to try to interpret this data through the computer center at NEIC, but the lack of staff time and stand-alone system prevented this analysis.

All the components of the USAID-funded project collected relevant data including: mini-hydro power, coal and lignite, bagasse, fuelwood, charcoal, paddy husk, natural gas, garbage/waste, biogas, oil shales, alcohol, fast growing plantations, solar energy, wind energy, and geothermal energy.

Numeric records usually form what is known as *resource data bases*. They are more complex to handle than bibliographic data bases as they are much larger in volume and more difficult to control and to manage. Few energy data bases in the world are able to provide assistance in managing such data bases. Since the content is domestic and retrieval needs are particular to the users of the country of origin, some local software may have to be developed. In the case of NEA, numeric data bases on the new computer system will have to be designed for energy consumption for various sources, availability and prices of energy resources imported into Thailand, and renewable energy resources. The volume of these data bases could be as high as 3-4 million annually processed records.

Bibliographic data

Most data bases in the world emanating from libraries are bibliographic. Such data bases are smaller than the numeric, easier to handle and manage, have internationally designed software to satisfy most of the needs of the customers and are transferable from one place to the other with few changes. As such, from the NEA library, a bibliographic data base was seen possible from the beginning, except for the fact that very little up-to-date data existed in the library for processing. The sources of these data had to be collected for two purposes: a) to build a collection that is modern and relevant for NEA, and b) to build a data base stemming from the analytics of this collection. Sources for the data come from monographs, serials, conferences, technical reports and project studies.

Sources of bibliographic data are monographs and monograph analytics (including conferences and seminars) serials and serial analytics, project records and statistical tables. Any item can be documented bibliographically in a data base, and be considered a record.

Monographs, chapters in monographs, conferences and papers in conferences, serials and serial articles can all become records. Statistical data appearing in Tables also may be treated as bibliographic records. They can be extracted from monographs or serials. Other sources of records can be project reports, company feasibility studies, agency reports, names and directories of energy centers, etc.

Annex VIII - Brief Instructions for the *NEIC Bibliographic Data Processing Functions* provides examples for recording most of the above.

Preparation of Input

The following section describes the procedures initiated and implemented in preparing both bibliographic and numeric data for input in a computer system.

Numeric data

Some of the numeric data are collected in files manually and some are stored on magnetic tapes and diskettes. The software utilized is the CDS/ISIS on the linkage IBM equipment, and connected through telephone lines with the NSO. After having been checked, the collected data is compiled and stored in computer media and sent to the NSO computer facility for processing and analysis. Hydrological and meteorological data are sent to the hydrology section at the Energy Survey Division for planning the annual hydrological data.

As far as the NEIC Project is concerned, the numeric data which needed to be worked on was that collected for the components of the Renewable Nonconventional Energy Project. As was mentioned before, data for various resources in Thailand are being collected, but interpretation and analysis are not done at the NEIC. Lacking the stand-alone computer system, the NEIC staff preferred to wait before developing any data bases, until the system 2
is installed and until they are properly trained in utilizing its software.

Bibliographic data

Since the linkage equipment available at the NEIC computer center was heavily used for NEA functions, and apart from the previous consultant's report regarding the processing of bibliographic data, nothing else existed for the bibliographic data base, the Project personnel found it necessary to start at the very beginning. Guidelines were outlined on how to process bibliographic data by the consultant, Mary Jane Ruhl, and were used to a certain degree. However, it was urgent that from the beginning, the staff be properly trained on processing data for input into a data base, instead of a library. This meant purchasing the tools necessary for the staff to read and to consult during their work and conducting training sessions on analyzing data for input *see Annex IV-H, Bibliographic Data Base Tools*. A data sheet was improvised by the consultant, Mary Jane Ruhl, based on the one used at AIT. This sheet was utilized for awhile with the staff in order to help them identify the most important fields, and to help them use the correct international tools properly. Later on, as will be explained, this sheet was dropped, and another one was utilized.

Processing Data via a Computer System

This section will explain how numeric and bibliographic data was processed at NEIC.

Numeric data

As was explained previously, the numeric data which pertain to NEA functions, and some of the data on energy resources are being processed on the linkage equipment to the NSO computer facility. All other data will probably receive proper attention after the new system is installed.

Bibliographic data

The Project personnel, feeling the need to build a data base, began searching in Bangkok for a computer facility that would accommodate the NEIC. AIT/RERIC was the most logical place to begin as it is a renewable energy research center. From disscussion with the AIT staff, it was decided that sharing in the computer system would not be possible because of the distance involved and the heavy usage of the computer by the students of AIT, as well as the lack of proper communication facilities between AIT and Bangkok. The other system that was considered was being utilized at the ESCAP library—the ESCAP Bibliographic Information System (EBIS). After discussion with the systems analyst there in November 1982, it was discovered that there were many advantages to be gained from sharing in that system. Among these advantages were a) the proximity of ESCAP to NEA, b) the compatibility of the software with the one NEIC and chosen, and c) the availability of computer space with no restrictions on time or funds. In other words, the NEIC staff could use it without charge. The systems analyst also offered professional guidance. Official agreements were reached in December 1982, and the EBIS data sheet was used. One staff member from NEIC was trained on data entry.

Retrieval of Data for the Users

On-line retrieval of data, whether numeric or bibliographic, is one of the basic purposes of the NEIC. Up to the time when NEIC began sharing in the EBIS at ESCAP, several attempts were made to identify potential users of the proposed data base. In May 1983, questionnaires were distributed to selected NEA officials to determine the types of materials they refer to daily, whether any research is carried out in the course of their work, and if so, on what kind of energy resources (Annex XI-A includes a sample). Eventually, the results of these questionnaires were used to determine selection and acquisition of materials rather than for user services. However, by November 1983, after NEIC had input in EBIS a considerable number of records (approx. 1000), a preliminary user survey was carried out. In addition, a list of subject headings (Annex XI-B) which the NEIC data base was utilizing, was circulated among 2-3 Directors of the Divisions. Their choices were later used for retrieval purposes. Bibliographic citations were distributed to them at two separate intervals (Annex XII includes a sample).

Since NEIC was borrowing computer time from EBIS, it was not possible to request retrieval of information whenever it was needed. However, any staff member could use the terminals at the ESCAP library and retrieve the information that was required with the help of the ESCAP staff.

Users could be identified as NEA users and non-NEA users. NEA users could request information from both the bibliographic and numeric data bases at NEIC. Non-NEA users or any organization or person interested in acquiring energy information could only get bibliographic information. Whenever possible, and after special arrangements, bibliographic citations could be issued from the data base, and regular library services could be given in the form of photocopies or extra available copies. Non-NEA users were informed of the availability of energy information through the regular publications *NEIC News* and bibliographies, and not through selective dissemination of information.

D. DEVELOPMENT OF LIBRARY ACTIVITIES

The establishment of a properly organized library to support the functions of the NEIC began before the NEA energy collection was joined with that of the NEA library. The activities that were begun included corresponding with publishers to locate up-to-date materials, requesting international tools to be used in cataloguing and classification, and in general, implementing the original plan that was laid out for NEIC.

Inventory of the Library Holdings

An inventory of the existing materials in the library meant physically screening the collection, item by item, to judge its relevance. Since government bureaux cannot, by law, discard or dispose of materials purchased with public funds, there was a considerable amount of peripheral materials to sort through. Irrelevant materials were sent out for storage and duplicates of serials were discarded.

Selection and Acquisition of New Materials

In the process of selection of new and up-to-date energy materials for the NEIC, several approvals were necessary before actual ordering and purchasing took place. Two methods were tried. The first was to make a file of the publishers' notices or copies of reviews in journals of energy books. After the selections were made, the file was sent to the Director of the Division (EPPD) for final selection and approval. The second method was to formulate typed lists of titles with estimated prices and to distribute a few copies of each list to most of the Directors of the NEA Division in an effort to secure the selection of more titles. The second method was preferred during the Project, as it proved to be more efficient. After approval on the selected titles, another list was made on a form that was developed by NEIC, and sent to the Deputy Secretary-General for final approval before processing. Processing involved sending a letter with the list, retyped again, to the agent or the publisher. The agent would then acknowledge receipt of the order and mail an invoice to NEIC. Upon receipt of the invoice, NEIC would prepare and send checks in US dollars with a letter signed by the Director of the Division accompaning this to the agent. Items ordered were usually received at NEA within 2-3 months. This was the process for selection and acquisition of all kinds of publications, monographs and books.

Other publications could be ordered directly by writing letters to the source. This was the case with technical reports, UN publications and conferences. Many of these reports and publications are distributed free of charge to government agencies.

Serials or journals

In the case of serials, the selection procedure had to be done annually. So, from 1982-1984, serial lists for selection were prepared twice and were distributed to the Directors and to members of the NEA Divisions. About 100 serial titles were subscribed to annually (see Annex V). In some cases, subscriptions were paid 2-3 years in advance in order to acquire reduced rates.

Microforms

The NEIC has opted to purchase microfiches and not microfilms. Equipment was purchased which can both read and make copies of the microfiches. As was explained previously, these are produced to save shelf space and can be airmailed expediently. The NEIC is purchasing technical reports on microfiches from certain organizations, particularly reports through the National Technical Information Service (NTIS) in the USA. The NEIC also hopes to acquire needed serial articles on microfiches which are otherwise unavailable, and to film in the library all project reports and feasibility studies completed by and for NEA which are currently stored in the library.

Magnetic tapes and diskettes

The numeric data base already possesses magnetic tapes and diskettes. The Energy Master Plan (EMP) for Thailand is also on magnetic tape. The bibliographic data base is, at present, stored on floppy disks at ESCAP. As soon as the NEIC computer system is installed and the software is applied, the transformations will be made by ESCAP, and a tape will be sent to NEIC. Acquisition of data on magnetic tape from sources outside NEA is not possible at present, unless they utilize or are compatible with the same software as that of NEIC. For the time being, only off-line citations from other data bases can be acquired.

Cataloguing and Classification

In April 1982, not all materials in the library were organized according to international standards. Those that were, had been organized using out-of-date tools. So the first step was to order and acquire cataloguing tools that were internationally recognized (see Annex IV-E). The staff and the Project personnel then proceeded to apply the principles outlined in these tools. It should be noted here that cataloguing and classification are functions which are ongoing in any library as long as new materials are received. Hence, it was not the intention of the Project personnel to finalize this process, but rather to establish procedures for it, and to see to it that the staff understood all the principles underlying the process.

Indexing

Indexing is a process that involves analyzing journal articles by subject, and either making cards for them to be filed in the library, or preparing data sheets to be used later for input into a computer system. Scientific serials in English already have indices to their articles. Thai journals, on the other hand, are not indexed professionally. It was decided to begin indexing all energy articles appearing in Thai journals that are received at the NEA library. Cards were prepared for the first set of articles and subsequent supplements were listed in issues of the *NEIC News* (see Annex XIII for the first index issued). This process is done manually. It may be automated in the future if the software for this indexing becomes available. At a later date, the library will need to decide which indices to subscribe to on a regular basis.

Abstracting and Keywording

One of the most important functions in building a bibliographic data base is to formulate abstracts and provide keywords or descriptors for all records that are made—whether these are formulated from monographs, serials, serial articles, conferences, papers from conferences and/or technical reports. This function means providing a free-text summary of the contents of the record, without any opinions, in order to give the user a clear idea of its relevance. For the purposes of NEIC, descriptive abstracts which are brief and given in short sentences were seen as best, since the staff work with English as a second language. In some cases, where the abstract is provided by the author, the staff would attempt only to make a summary of it, rather than of the document itself. Care was taken not repeat words used in the title or in the descriptor field. Keywords or descriptors are technical terms designed to give an idea about the document. Annex IV-H provides several titles of kinds of thesauri that were consulted by NEIC, and which eventually led to the formation of the NEIC Keyword or Descriptor List (Annex VIII-B).

All these procedures were affected by the fact that NEIC was borrowing computer space and time from ESCAP, specifically in the type of keywords to be selected, and the total number of characters designed for an abstract. Added to this is the fact that for retrieval purposes, NEIC, on several occasions, had to utilize the EBIS thesaurus of descriptors and not its own. The NEIC data base was not totally integrated within EBIS, since the arrangement was temporary.

Building a Thesaurus

Several thesauri exist in the energy field. Some are concerned with energy resources totally, such as the one utilized by the US Department of Energy for its Energy Data Base (EDB), and some are concerned with renewable and rural energy, such as that utilized by the Asian Institute of Technology/ Renewable Energy Resources Information Center (AIT/RERIC). Since the NEIC is dealing with both conventional and renewable energy sources, it was deemed necessary to refer to both whenever a term was to be selected. Those terms formulated the *NEIC Keyword List* (see Annex VIII-B). This list will eventually be the NEIC Thesaurus after"Broader and Narrower Terms"are added to it.

Another list which was also formulated at the same time was the *Subject Headings List*. This is a list of"Broad Terms"which is utilized in the formation and retrieval of bibliographies from the data base (see Annex VIII-C).

Preparation of Data Sheets

Bibliographic data

The Project consultant, Ms. Mary Jane Ruhl, formulated a data work sheet for the bibliographic data base. It was not utilized because of the agreement and arrangement to share in the EBIS at ESCAP. Instead, the data sheet of EBIS was utilized, and even then not completely. (Samples of both are in Annex VIII). The final decision on what type and number of fields to be included on a data sheet will be left to those building the data base and to those who will utilize it. There are also fields that are optional and those that are obligatory (Annex VIII explains these in details). The *EBIS Reference Manual for the Entry of Records in EBIS 1982 and 1983*, was the main tool for all these decisions at the time. The Project personnel and the staff are studying the data processing manual of the MINISIS software and will be developing the required data sheet as soon as the system is installed.

There is one point to be mentioned here, and that is, the NEIC, decided to document statistical Tables of energy resources, consumption, supply and demand etc., decided to treat these Tables as bibliographic data. This means a data sheet is filled out for every Table selected, and an abstract is made and keywords are provided for it. The descriptor, collation and subject heading fields will indicate that this is a Table. This procedure is a way of referring to these Tables; i.e., when retrieved,only their location, descriptors and abstract will appear—and no actual figures will be seen. The MINISIS manual provides for the processing of statistical data, but it is treated as part of a bibliographic record, and not separately. There is a definite need to refer to statistical Tables as separate entitles, as there is heavy demand for them by NEA users.

Numeric data

In the numeric data base, approximately 500,000 card image records related to hydrology and meteorology, and 10,000 records related to primary data of domestic and industrial energy consumption are processed each year. The collected data, after having been checked, is compiled, stored in computer media and sent to be processed by the mainframe computer at the National Statistical Office (NSO). There is a need to make an inventory of the data files compiled to determine the number of files, the quantity of data and their use. A directory of available data resources should be formulated. This may include files which will be input in the NEIC computer system as well as the files which should be catalogued specifically for the directory. This directory will refer users to other resources. It is hoped that the new computer system will be used to generate reports required by NEA on a regular schedule and to provide on-the-spot analyses on the data and projections based on the requests of the officials.

Indentification of NEA and Non-NEA Users

The Project personnel were hesitant to begin user identification and surveys before any data base was properly established. User services could not be announced to them. However, within NEA, some identification of the needs of the users was possible through a brief questionnaire (see Annex XI). In the future, the NEIC staff will need to survey the NEA users more thoroughly, particularly to find out how many data-collecting Divisions there are, their functions, if they collect data, and if so, what type, how it is handled, processed, up-dated, continued, published etc., and whether the data will be given to NEIC for processing or not. Outside NEA, and within Bangkok, close contact to develop user relationships was done with AIT/RERIC and with ESCAP/EBIS in the latter part of 1983, after the NEIC had accumulated some information for exchange purposes. Non-NEA users outside Thailand, were also identified throughout the duration of the Project, by correspondence. The *Directory of Energy Centers*, Annex XIV, and the *Mailing List*, Annex XV, contain potential users of the NEIC. Closer contact and exchange of information will be required in the future with selected agencies.

E. SERVICES AND PUBLICATIONS

In order to promote NEIC, it was necessary to commence provision of information services and to produce certain kinds of publications. The purposes of both were to build a reputation for NEIC as a source of information on energy, and to build a group of clients or users who will depend on NEIC for particular kinds of information. Without these two functions, NEIC would have a sterile existence.

Services

The provision of energy information is made through various kinds of services. These can be categorized as services from the library and services from the data base.

Services from the library

Libraries, including the one at NEIC, are accustomed to providing services of one sort or another. Even when the NEIC collection was in its embryonic stages, it was giving information services by answering reference questions and locating articles in serials and papers of conferences. In the NEA library, these services grew to include circulation or the lending out of materials to NEA users, answering reference questions and, with the purchase of new equipment, photocopying and microfiche reading and printing were added. Current awareness services such as photocopying title pages of serials and important documents and circulating them, was also performed. This added a new dimension to the NEA library, and that was to go out and look for the user, instead of waiting for his/her requests. Numerous letters requesting information were also received and were answered, through the available documents at NEIC, or by referring the user to other agencies where the documents exist.

Services from the data base

Such services were not possible until the establishment of the bibliographic data base at ESCAP. Therefore, in November 1983, lists of bibliographic citations of selected subjects were retrieved and circulated among the Directors of NEA Divisions. This was done on a trial basis, and in the future it has to be done regularly based on user profiles. Services from the numeric data base are not yet announced, although a data base does exist. Within NEA, the NEIC computer center receives the data and processes it within a set program based on needs designated by the Division collecting or requesting the data. There is a plan to disseminate data to the public. The data which is issued in manuals annually from the Energy Economics Division as well as the data from other sources including the data from the Energy Master Plan, will be processed through the NEIC.

Publications

Publications are needed to advertise the NEIC functions and services. These could be produced manually or by automation. Since for reasons explained previously, it was not possible to utilize the linkage equipment for the publications, it was seen necessary to produce these publications manually.

The NEIC News

By the end of the Project (June 1984), NEIC will have published 6 issues of the *NEIC News* (see Annex XIV). The first issue was published in May 1983, in mimeographed format, and contained the following features:

- Background statement on the Renewable Nonconventional Energy Project
- The NEIC component, its scope, its present work and future plan
- A list of new titles added to the library in English and in Thai

This first issue totalled 15 pages and Thai was the language used in the major feature articles.

In July 1983, a Publications Officer paid from the Project was employed, and subsequently, more attention was devoted to the *NEIC News* in order to make it look more like a professional publication. A colored title page was professionally designed outside NEA, and an NEIC logo was selected to appear on the title page. The contents were again mimeographed. Considerable changes took place in the second issue (June 1983). It was decided to have the *NEIC News* published on a quarterly basis, and the following features appeared:

- Follow-up report on components of the Project. This included publishing research articles from these components, other than progress reports
- Interviews with prominent people in renewable energy and working in Thailand
- A major energy article, translated from up-to-date journals, which was relevant to the energy situation in Thailand
- New technology in renewable energy taken from journals
- Lists of new books in English and in Thai
- Index of energy articles appearing in Thai journals
- Interesting books selected and reviewed
- Energy on-line data bases that NEA can contact for information
- A calendar of conferences and a description of a conference that took place in Asia.

As more issues were produced, improvements were made regarding addition of photographs and layout. Issue No. 4 (Annex XV) can best illustrate these improvements. About 300 copies were printed of each issue of which 250 were mailed inside and outside of Thailand. The remaining 50 were kept in the library for future demand.

The NEIC brochure

A two-page brochure was designed several times by utilizing the services of an NEA staff member, as well as professional printing houses (see Annex XVII). The contents appear in Thai and in English. Work on the brochure was begun in late 1982. The delay in its printing was due to the fact that the cover was not complete, and to the fact that it announced computer services before the computer was installed.

Directory of Energy Centers

This list began with about 45 energy centers for research and information that are distributed all over the world which NEIC had contacted (see Annex XIV). Eventually, the list grew to include over 100 Centers. In August 1983, a questionnaire (Annex XVIII) was formulated and distributed to a selected list of these energy centers in Thailand and in ASEAN. By November 1983 a majority of these questionnaires were received, and were tabulated and organized to formulate the directory. The research emanating from these centers was emphasized through listing of its titles.

Library Users Handbook

The *Library Users Handbook* is a small manual written in Thai, designed for distribution to users of the NEA library. It is a description of the collection and its organization written to show readers how to use the library.

Library procedures manual for the staff

This manual is a detailed manual for every process that the library applies—acquisitions, cataloguing and circulation (see Annex VII). Several meetings with the staff took place in an effort to help them document these processes. The result was given to the Project personnel in flow-chart format. This is a mimeographed manual and will only be distributed to the staff. It is written in Thai.

Bibliographic porcessing manual

The Project consultant in 1982 wrote a manual for data processing outlining each field required by NEIC. It was partially utilized until the time when NEIC began to input data in ESCAP/EBIS, when it became obligatory to use the *Reference Manual for the Entry of Records in EBIS - 1982 and 1983*. A preliminary manual for the NEIC was formulated (see Annex VIII) which described obligatory fields for the bibliographic data base. It included filled-out sample worksheets. This may be subject to change after the MINISIS software package becomes operative.

Bibliographies - general and tailored

Eleven bibliographies were prepared, four manually and seven from the data base. These can be describes as follows:

1. *Energy in Thailand - Selected References*. September 1982 (in English)

2. *Energy in Thailand - Selected References*. November 1983 (in English) (see Annex XX)

3. *Energy Serials*. March 1983 (in English and in Thai) (see Annex V)

4. *Index to Articles on Energy in Thai Journals*. May 1983 (in Thai) (Annex XIII)

From the data base at ESCAP/EBIS:

1. A list of serials subscribed to by NEIC, arranged by title, with holdings, details and descriptors

2. A short bibliography on energy modelling

3. A complete bibliography on energy in Thailand - books and serials and their analytics. This served as a basis for the manually prepared bibliographies, *Energy in Thailand - Selected References*

4. Short bibliographies on energy conservation, and several renewable energy sources

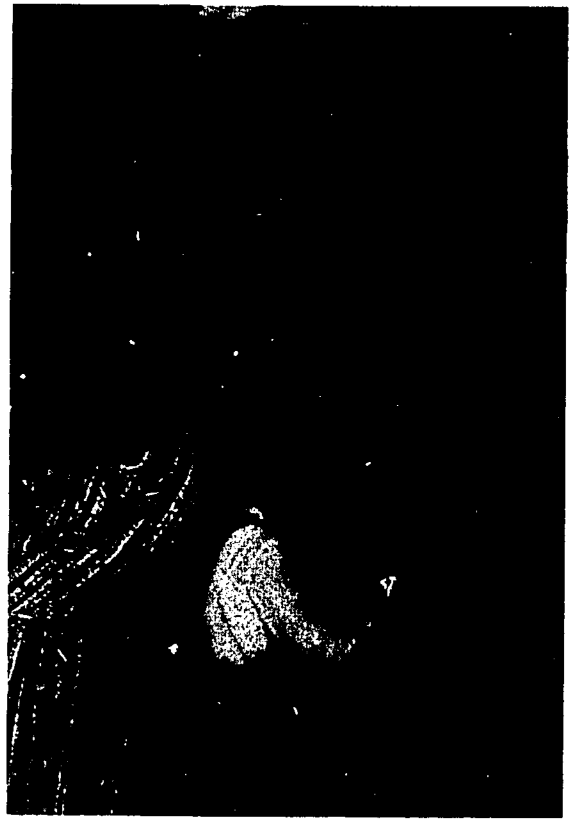
5. An authority file on corporate bodies used by NEIC

6. An authority file on meetings and conferences

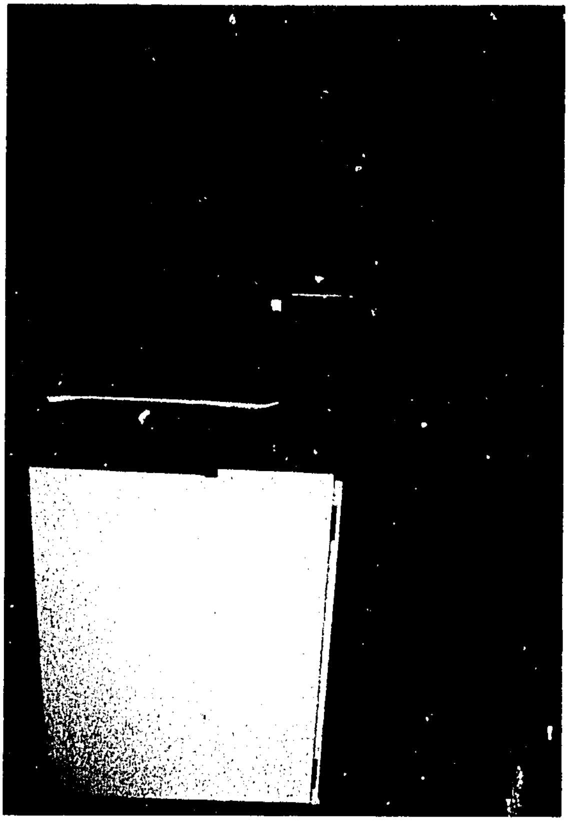
7. A list of descriptors utilized by NEIC, and the number of times each one occurs in the data base.

The accumulation of records in an organized fashion, if manually prepared, is time-consuming. But it was seen necessary from the beginning to commence issuing bibliographies to the users, even if they had shortcomings, as this was the only method to get feedback on the needs of the users, and the relevance of the work.

Training on use of MINISIS software by Project Advisor from IDRC.



Staff member using microfilmer purchased with Project funds.



Microfilmer purchased with Project funds

Microfiche Reader/Printer

Chapter 5

Discussion and Analysis of Accomplishments

DISCUSSION AND ANALYSIS OF ACCOMPLISHMENTS

This chapter is concerned with analysing the pros and cons of procedures selected for implementation in each of the Divisions of the NEIC. As such, it will discuss only certain procedures and their alternatives. It should be taken for granted that if a procedure is not discussed, it means it has been the best alternative available.

A. ORGANIZATION OF THE NEIC

Before implementation of any procedure, considerable discussion took place between the Project personnel and the government officials of the NEIC. Several factors underlying the execution of the Project must be mentioned:

1. It was imperative to apply existing government procedures to functions and procedures developed within the NEIC and to work within the system available at the National Energy Administration (NEA). This situation was both advantageous and dis-advantageous at the same time. It was advantageous in that it eliminated creating a new set of procedures for some functions on the part of the Project personnel. It was dis-advantageous in that, government procedures, as in any country, are always time-consuming and require approvals of superiors before implementation can take place.

2. Mary Jane Ruhl, consultant for NEIC in 1981, did outline the future functions clearly and these were accepted by the Project personnel as feasible.

3. The stand-alone computer system did not exist at NEIC, and it became necessary to locate one outside the NEA premises to accomodate NEIC's information needs.

All three of these factors greatly influenced the procedures established and implemented by Project personnel from the beginning and had to be considered as the foundation upon which the NEIC was built.

<u>The Library</u>

Lack of adequate space at NEA has forced NEIC to remain divided into two floors. In 1982, the Project personnel investigated various alternatives in available rooms, but none was big enough to accomodate both the library and the computer center. Hence it is going to be hard to make users see NEIC as one unit, where the library functions coexist with those of the data base. This lack of unity will also create difficulties in communication among the staff.

The NEIC library can be considered as a prototype energy library in the public sector in Thailand. As such, in its procedures of selection, acquisitions, cataloguing and classification of materials, it had no example to follow, and did innovate in order to accommodate local conditions.

First contacts with sources of energy information

This was done in order to locate new and up-to-date materials for the NEIC in energy information. Again, it was time-consuming to prepare lists for two or three people to approve, and then to estimate the total amounts expected to be spent. Since it was made very clear to the Project personnel that NEIC should not exceed the assigned budget, such limitations on selections and approvals were not necessary throughout the duration of the Project. As the time element was crucial, another procedure that could have better served the purpose, was to have prepared lists of energy materials to have ordered these from agents or publishers. What NEIC could have applied, in order to avoid repetitive approvals, was to have drawn up guidelines for selection of materials, and to have had these approved by the Division Director at the outset. This could make the ordering procedure automatic, and not time-consuming. One big disadvantage with the selection process as it stands, is that those directly involved lose interest and initiative in the long run, as they have no decisions to make.

The Computer Center

The basic drawbacks in the procedures applied at the computer center of the NEIC can be summarized as follows:

1. Lack of sufficient computer time in the sharing with the NSO systems.
2. Lack of managerial staff at NEIC required to accommodate and coordinate the energy information needs of NEA.
3. The data collected and delivered to NEIC for processing may be incomplete, incorrect or out-of-date.

The solution to the above problems cannot only be through the purchase of the stand-alone system for the NEIC, but rather in integrating the role of NEIC in the processing of NEA's information needs. NEIC cannot control the collection of data, but can draw the attention of concerned Divisions to the problems of data collection through regular meetings and feedback.

Between 1982 and 1983, considerable discussion took place before a decision was reached as to the type of hardware and software to be selected. The fianl decision was to purchase a mini-computer system from Hewlette Packard Co., mainly for the hardware as recommended by the Consultant. The system was installed in June 1984. As for the software, the NEIC was using the MINISIS software given to it by the IDRC. However, for the numeric data, NEIC still has linkage with the NSO until the software can be studied properly.

B. STAFF AND TRAINING

There were no problems concerning the training of government officials on-the-job, but any training that involved an external agency, had to be approved by the Department of Technical and Economic Cooperation (DTEC).

C. DEVELOPMENT OF DATA ACTIVITIES

Numeric Data

No new procedures were initiated by the Project personnel for the processing of numeric data. All such procedures will have to be initiated, perhaps after June 1984, when the new system is installed. However, the Project personnel were able to identify: a) sources of numerical data, b) difficulties met in the processing of data, and c) needs of the numerical data base. All of these factors were discussed in detail in Chapters 3 and 4.

Hence the *Library Procedures Manual* (see Annex VII) does not contain or discussion of the numeric data base, as these procedures will be subject to change after the new system is installed.

Bibliographic Data

Having no bibliographic data and no computer system to accommodate this type of data on the premises, the NEIC searched for an external computer system that could assist in building an energy base. The most logical place was at the Renewable Energy Resources Information Center/Asian Institute of Technology (RERIC/AIT). In fact, in order to avoid any duplication, every attempt should have been made to process energy data through the RERIC. A meeting was held at AIT with the people responsible for RERIC, and, although willingness to cooperate and to train were exihibited, the following factors played an important role in preventing such cooperation:

1. AIT is too far from NEA (1½ hours' drive)
2. AIT/RERIC utilizes the ISIS software, whereas NEIC had selected the MINISIS software
3. AIT does not have adequate computer space and time to assign for NEIC.

The second best alternative selected was to process the data through ESCAP/EBIS, temporarily, until the stand-alone system could be installed. The advantages were:

1. Proximity of ESCAP to NEA (10 minutes' drive)
2. Availability of adequate computer space and time
3. Provision of expert systems analysis guidance 3-4 times/week
4. Utilization of the computer terminals at no charge to NEIC
5. Data from EBIS can transfer to MINISIS.

The disadvantages were:

1. No energy data base existed at ESCAP
2. Terminology used by NEIC would have to follow the EBIS thesaurus
3. NEIC staff will be trained on keying in data but not retrieving it.

This cooperation and sharing with EBIS naturally dictated all procedures necessary for processing of bibliographic data. The EBIS *Reference Manual for the Entry of Records* was then utilized, and in fact later on, served as a major source of guidance in the writing of the data processing rules for the NEIC.

D. COMPUTER FACILITIES AT NEIC

Existing procedures in this section have been discussed at length in Chapter 4. There is one fact that should be mentioned—there was considerable delay in deciding on the type of hardware and software to purchase. So much so, that the system was not installed until June 1984. The best alternative would have been to have decided on this equipment and to have had it installed in 1982, so that 1983 and 1984 could have been spent processing data on the premises.

E. SERVICES AND PUBLICATIONS

Not having a computer system also affected the services that should have resulted from the establishment of the NEIC. As such, any services for the users were manually prepared through searches in the library catalogues. However, limited services of off-line citations became possible from the EBIS subset of energy data of NEIC, after December 1983.

The same statements can be applied to publications. All were manually prepared, with the exception of one or two bibliographies, which were retrieved from the data base. At present, the publication which receives the most attention is the *NEIC NEWS*. Since this appears in Thai, and considerable amounts of translation from English to Thai take place, it will be impossible to automate it for the time being. Ideally speaking, all publications should have staff assigned exclusively for their production, and these publications should be produced regularly. The first condition was not, and could not be met by NEIC government officials and this,in turn,will have an effect on the second condition. The Project personnel were, for the most part, responsible for the issuance of the publications on a regular basis.

Chapter 7, Recommendations, will discuss the solutions envisaged for the problems encountered.

Chapter 6

Conclusions

CONCLUSIONS

A. ORGANIZATION OF THE NEIC

- The NEIC was established by a Cabinet decision at the NEA in 1978. It serves as an energy information center in which all types of energy data, documents and reports are collected. This data was analyzed and used to formulate the Energy Master Plan. The NEIC is a prototype energy information center for both public and private sectors in Thailand. In addition, it serves as the energy information referral center for information exchanges among other agencies.

- In 1982 the NEA reorganized its divisions and the NEIC became a section of the Energy Policy and Planning Division. At present the NEIC includes the NEIC Project, the NEA library and the System Analysis section.

- The NEIC established an up-to-date energy library organized according to international standards, and which was referred to by users regularly.

- The computer system was installed in June 1984, therefore, data processing activities will be forthcoming.

- The NEIC library was renovated and equipped with new equipment and furniture.

B. STAFF AND TRAINING

- The NEIC civil servants were provided formal training on information systems in Bangkok and on Hewlett/Packard hardware in Singapore.

- The NEIC organized a software (MINISIS) training program with technical cooperation from the International Development and Research Center (IDRC) during June 24-July 13, 1984, at NEA for its staff and other interested institutions.

- The NEIC provided ongoing on-the-job training during 1982-1984 for all the staff.

- The NEIC is short of personnel because of frequent staff turnover.

C. DEVELOPMENT OF DATA ACTIVITIES--BIBLIOGRAPHIC AND NUMERICAL

- A bibliographic data base in energy was established by NEIC, in an external computer system, comprising approximately 1,200 records.

- At the same time, 940 records were prepared for input, and 2,300 were selected for bibliographic documentation.

- After the installation of the mini-computer system in June 1984, the bibliographic data base using the MINISIS software was established.

- The NEIC documented procedures for bibliographic data and for numeric data processing.

- The NEIC is processing renewable energy data, NEA administrative records, meteorological and hydrological data.

- The NEIC developed a thesaurus of energy terms for the data base.

D. DEVELOPMENT OF LIBRARY ACTIVITIES

- The NEIC inventoried all the library collection and discarded peripheral material.

- The NEIC inventoried all the library procedures, flow-charted them and published them in a Library Procedures Manual.

- The NEIC established an up-to-date energy library in two languages--English and Thai.

E. SERVICES AND PUBLICATIONS

- The NEIC offers some user services based on the library collection and some data base services from the bibliographic data base.

- Regular services and on-line searches will be offered by the NEIC computer system.

- Information services are provided for NEA Divisions from the numerical data base.

- The NEIC documented guidelines for readers on how to use the library.

Publications

- The NEIC issued a newsletter, bibliographies, and manuals, in Thai and in English. Some of these publications were produced on NEA premises, while others were printed by professional agencies.

- The NEIC printed at least 200 copies of each publication for distribution inside and outside of Thailand.

- The NEIC developed a mailing list of people and centers inside and outside Thailand who receive its publications.

- The NEIC surveyed energy centers in Thailand and ASEAN for the purpose of printing a directory of potential users.

- The NEIC published a brochure (in English and Thai) announcing its services and publications.

Chapter 7

Recommendations

RECOMMENDATIONS

A. ORGANIZATION OF THE NEIC

- The NEIC should be unified in a single unit so that the user can easily locate all the information. The interrelation between the library and the computer center should be more clearly identified and the services offered to the users should be made more distinct.

- The library, though renovated, remains small. It may be able to accommodate growth in the collection, but not for more than two years. More spacious premises (of at least double the present ones -- 64 m^2--128m^2) will be needed in the future.

- The computer center is also small. Any contemplated expansion of the system must consider larger premises, particularly for accommodating the staff.

- In the future, NEIC needs stronger support in terms of budget and manpower; otherwise it will not have sufficient resources to handle the functions and services as planned.

B. STAFF AND TRAINING

- The staff are to be commended on the support that they gave to the NEIC Project. A recommendation is made that permanent status be provided in order to try to eliminate the frequent turnover of the staff.

- Managerial capabilities should be developed to coordinate the data base as a whole. Through the USAID Project, there was no time to implement the training of a data base manager. The NEIC has requested assistance from the United Nations Development Programme (UNDP) to provide this training for 1985-1986. For this reason, NEIC needs to follow-up this matter closely with UNDP, which in turn has exhibited willingness to provide support.

- Additional training for the NEIC staff should be provided to develop the numerical data base -- particularly in how to use data through the Energy Master Plan model. Such possibilities will need to be considered with the experts of IDRC and UNDP at a later date.

- The library does not have sufficient staff. It is recommended that two more qualified civil servants be employed to assist in building the bibliographic data base and in the production of publication .

- Translation from English into Thai is a daily occurrence at NEIC, particularly since energy information of any international significance is published in English; therefore, all NEIC staff need to be better versed in the English language.

C. DEVELOPMENT OF DATA ACTIVITIES
Bibliographic and Numerical

• The NEIC plan in 1982 had envisaged the preparation of 4-5,000 records in the bibliographic data base. That number was prepared but only 1,200 were input in EBIS at ESCAP. It is recommended that the tape be brought from ESCAP, integrated at NEIC and all records be input. This should be an ongoing process.

• As for the numerical data base, an expert in this field would be helpful. Although the NEIC officials have received initial training, they will still need expert guidance to utilize the new system to its maximum capabilities, and to see how it can be used to fulfill the needs of NEA, particularly in the issuance and publication of data. A manual outlining these procedures should be written. In the future, it is recommended that both the numeric and bibliographic data bases receive equal attention as far as data base management is concerned.

• With the installation of the new computer system at NEIC, a leading role for the NEIC should be encouraged and developed--that of a referral center for energy information in Thailand. A regional network for renewable energy information is being established in Manila, Philippines with UNESCO support and the Ministry of Science, Technology and Energy is the focal point for this network in Thailand. Thus, if NEIC is given the needed support and funds it could assume the role of handling energy information for Thailand.

• The NEIC should also widen its sources of information by subscribing to international energy information sources and data bases. Although these will require a large outlay of funds, the information they provide, particularly the statistical type, is worth the expenditure.

D. DEVELOPMENT OF LIBRARY ACTIVITIES

Additional staff should be employed in the library to assist the librarian in preparation of bibliographic data, producing publications and managing the library and reference services.

• The NEIC should continue to assume an active role in providing users with information regularly through the distribution of bibliographies, surveys and other publications.

E. SERVICES AND PUBLICATIONS

Services

The NEIC must begin to assume a more aggressive role in disseminating information. In order to assume this role the following should be considered.

- The NEIC should avoid becoming archival.

- The NEIC should search and determine the NEA information needs by regularly meeting with the NEA Divisions.

- The NEIC should be the only referral source for energy information in Thailand.

- The NEIC must maintain an up-to-date energy library with an emphasis on energy statistics.

- The NEIC must continously publicize these services in order to attract more users.

Publications

- The NEIC needs to continue the publications issued through Project assistance. It is recommended that additional personnel be assigned to this unit and an effort be made to have these publications professionally printed.

- The NEIC should continue the *NEIC NEWS* as a quarterly publication. Numerous positive responses were received concerning this newsletter. At least two staff members should be assigned to its production. An effort needs to be made to compare it with other NEA publications to determine its value and to avoid duplication. More original articles or features could be included along with surveys of Thai expertise in renewable energy sources.

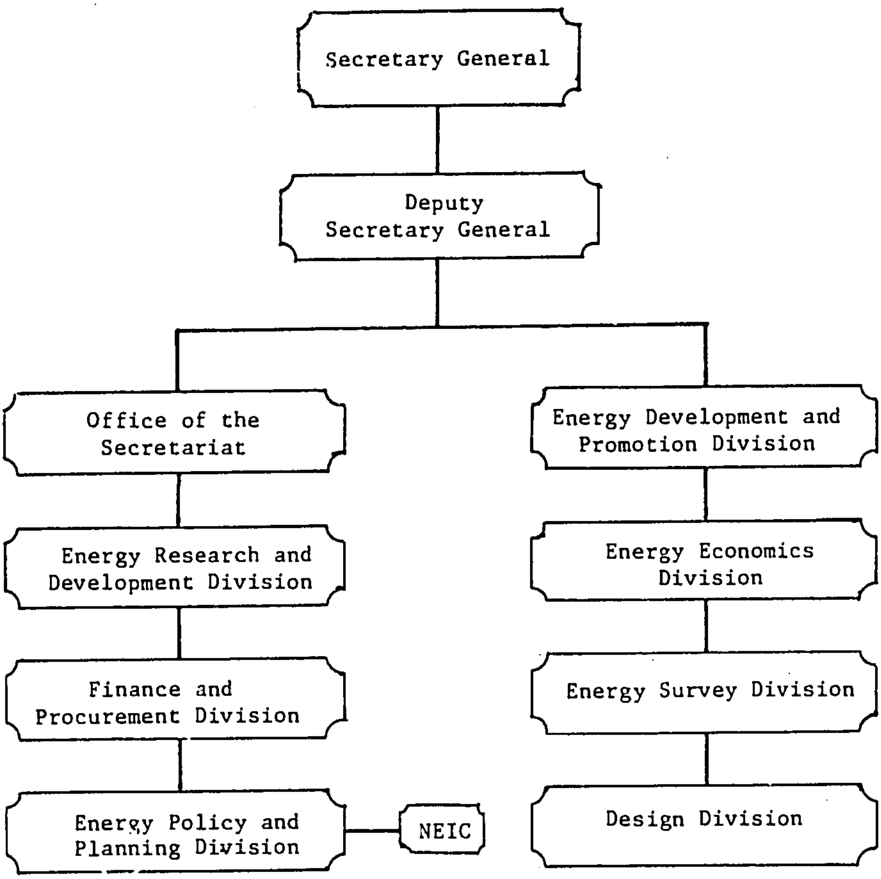
- The library should continue issuing bibliographies from the data base on a regular basis. This should be done often, depending on how frequently the data base is updated.

- The NEIC should maintain contact with the ASEAN energy centers that were identified through the Directory, and should search for more centers to issue a supplement.

Annexes

Annex I

ORGANIZATION CHART OF NATIONAL ENERGY ADMINISTRATION
(NEA)



Annex II

DETAILED WORK PLAN FOR THE

NATIONAL ENERGY INFORMATION CENTER

Mary Jane Ruhl

March 18, 1981

I. Introduction

The responsibility of the National Energy Administration is to recommend to the Government of Thailand optimum policies,strategies and plans for development of an energy system in Thailand.

In carrying out this responsibility,NEA has become an important source of energy data for both public and private agencies.

Therefore, the National Energy Information Center (NEIC) has been organized within the Regulatory Division of NEA.

The NEIC will perform three major functions:

(1) To serve as a comprehensive energy data center which will collect and provide statistical, technical, and other related data on energy resources, its potential, production, demand and supply; and related environmental, social and economic data;

(2) To provide library services for reports, textbooks, journals, and other documents on energy and related subjects; and

(3) To serve as a link between its users and energy related data and information organizations and data resources outside of the NEA.

The EDCT will be developed and implemented according to a plan and schedule which is described in the following sections:

- Organization
- Staffing and training
- Development of data activities
- Development of library activities
- Computer facilities
- Office facilities and equipment
- Costs

Each section will include the schedule for its implementation during the next three years, beginning with April 1981 as Month 1.

II. Organization

Initially, the NEIC will be a section within the Regulatory Division of the NEA. It will be able to function as a division of the NEA in two years.

III. Staffing and Training

The personnel required for the NEIC are listed below, along with the schedule for phasing them into the program:

Personnel Type	Phasing Schedule (Project Months)	Full-Time Equivalent
EDCT Manager	throughout	one
Energy Subject Specialist	throughout	one-fourth
Technical Information	1-6	one-half
Specialist/Systems Analyst	7-continuing	one
Statistician	3-continuing	one-fourth
Librarian	throughout	one-half to one
Library Technician	throughout	one
Translator	3-continuing	one
Computer Programmer	throughout	one
Clerical Staff	throughout	one to three

Descriptions of requirements for these personnel and proposed grades are as follows:

NEIC Manager (Grade 7): The NEIC Manager's background should include several years of Government experience, particularly in agencies related to energy issues. The Manager should have knowledge of statistics and technical information, preferably with some experience in automated data processing. It is preferable that the Manager should have an appreciation for serving and educating users of information services.

Energy Subject Specialist (Grade 6): The Energy Subject Specialist will require knowledge about energy technology in the Government and particularly in the regulatory setting. This person (or persons) should be drawn from NEA's present staff of technologists and/or economists.

Technical Information Specialist/Systems Analyst (Grade 6): The Technical Information Specialist (TIS) will require experience in statistical data systems and information retrieval systems. Knowledge about energy data and familiarity with energy data user groups is essential. Library systems work will be required.

Statistician (Grade 5-6): Present NEA Statisticians would be preferable. The Statistician will be required half-time. An alternate staffing plan is to employ Grade 5 and Grade 6 Statisticians on a one-fourth-time basis.

Librarian (via USAID contract): The Librarian's background should include document processing experience rather than conventional library experience only.

Library Technician (Grade 3): The Library Technician should be experienced in reference library work and should be skilled in cataloging and document processing. Statistical data analysis skills are preferable. Data entry tasks will be required.

Computer Programmer (Grade 4): The Computer Programmer requires experience in statistical data systems. Learning a library system will be required.

Translators (two) (Grade 4): The Translators should be familiar with NEA's information and the needs of the user groups. Present NEA Translators are preferable.

Clerical Staff: Standard typing and filing skills will be required. Data entry tasks will be part of the work.

Training of the personnel to perform the work specifically required for NEIC will be done on-the-job. In performing initial data and library inventories (described in the following sections) and in preparing computer input according to systems specifications,they will become familiar with the work requirements.

The primary source of instruction will be via the consultants (see page 13). They will be responsible for informing NEIC staff on work procedures relating to the overall operation of an information center and to the specific library and data systems to be used by the NEIC.

IV. Development of Data Activities

The data activities will be performed according to specific tasks, described as follows:

1. Identification and Selection of Personnel

NEA will identify and recruit personnel with data processing capabilities to be employed in the NEIC. In addition, consultant specialist will be identified, employed, and initiated into the work of the NEIC.

2. Inventory of data files and computing activities

The data files compiled by or utilized by the Regulatory Division will be inventoried to determine the number of files, the quantity of data, and their use. In addition, the computing activities which are presently being performed in the Regulatory Division will be listed along with the computer facilities and software used. This will provide information about the volume and types of data to be handled by the NEIC and the various processing and reporting requirements. It will also provide a directory to all available data resources for use by all Division personnel.

3. Identification, selection, and acquisition of additional non-NEA data resources

Data resources outside of NEA will be identified to be considered for addition to the NEA's collection of files. These will include files that will be input to the NEIC computer system as well as files that will be cataloged and included in the directory, but will not be input to the NEIC system. Decisions will be made as to which files should be input and which should be cataloged specifically for the directory. The directory will be used to refer users to other resources.

Those files which are selected for inclusion into NEIC's system will be acquired by contacting the organizations where the data originate and establishing agreements with them, to obtain their data on a regular basis. Procedures will be established and implemented for receiving, logging, and processing these data.

4. Processing data

The findings from Tasks 2 and 3 will be examined to determine how the various data files should be processed. For example, the Energy Master Plan data management activities will be coordinated through the NEIC, but exactly how the data and its processing fit into the NEIC's activities will be determined within this Task. A plan will be devised to collect and prepare data for input via a centralized scheme, to avoid duplication of effort in data collection and processing and to ensure the widest uses and applications of the reports and services processed by the NEIC. Systems available at NSO will be selected for use. In addition, a data management system will be acquired for NEIC's requirements relating to policy analysis. It will be used for NEA's special requirements for energy consumption tracking, resource allocation, and forecasting.

5. Preparation of computer input data

The data will prepared for input by making any conversions or correction which might be required. The data will be input to the computer system, verified, and corrected to satisfy special requirements identified from Task 3 findings.

6. Processing via computer system

The computer system will be used to generate reports required by the Regulatory Divison according to a regular schedule. In addition, it will be used for on-the-spot analyses on the data and projections, which will be performed upon request by appropriate officials.

V. Development of Library Activities

The library system initially will be maintained manually. The library materials will be processed according to the specifications of the ISIS system, so that later on library data can be input to the system at NSO without additional editing or preparation.

1. Identification and Selection of Personnel

NEA will identify and recruit personnel with library-related capabilities, to be employed in the NEIC. Consultant specialists from AIT will be initiated into the work of the NEIC, and they will begin to train NEIC personnel in ISIS-related work.

2. Inventory of library holdings

An inventory of library holdings at the NEA and Regulatory Division will be taken. The results of this inventory will be used to assign priorities to the material to be processed into the library system. These priorities will then be used in processing the material as described in the remaining tasks.

3. Cataloging/indexing of present collection

The present holdings of the NEA library and the Regulatory Division library will be cataloged according to the ISIS specifications and indexed via the Thesaurus for Energy and Rural Development (by Diane M. Pruett and Ted S. Toyoshiba, Jr., Energy for Rural Development Research Materials RM-80-1, East-West Resource Systems Institute, East-West Center, Honolulu, Hawaii, September 1980). Any problems resulting from the use of the ISIS or East-West materials will be noted and solutions or more detailed specifications will be developed and documented.

In addition to indexing via the East-West thesaurus, a classification scheme will be developed which will allow the documents to be coded according to the broad subject areas of the NEIC. The documents will then be coded via the classification scheme.

4. Identification of relevant non-NEA information resources and establishment of organization resourced and establishment of organizations resourced and establishment of organizations' relationships

Energy-related information centers will be identified and relationships will be established via correspondence from NEA. Those organizations'holdings lists and information about their services will be collected and filled.

5. Preparation of directory and referral service

From the information collection for Task 2, a directory file will be prepared which describes each organization, its address, telephone number/telex/cable address, contact person description of holdings, subject coverage, publications and semces, and charges. This directory will be prepared according to a standardized format and, when required, a document containing these descriptions will be prepared and disseminated to NEA and other NEIC users. The directory information will, eventually, be input to the ISIS system to facilitate updating and revision of the directory.

6. Selection and acquisition of new materials

New materials will be selectrd from the other organizations' holdings lists and from other energy-related information resources identified throughout the project. They will be ordered and, when received, they will be logged into the library files and prepared for subsequent processing.

7. Cataloging/indexing of new materials

Newly-received library materials will be cataloged and indexed using the ISIS specifications, the East-West Center's thesaurus, along with any modifications adopted during the processing of the initial library holdings. The cataloging and indexing information will be carefully checked to ensure accuracy of subject-related information and conformance to the ISIS standards. In addition, spelling and typographical accuracy will be checked to ensure uniformity of the data for eventual computer storage and retrieval. A card file of cataloging and indexing information (author, title, institution, and subjects) will be developed and maintained during the first 12 months. It will be phased out as soon as the computer system can provide alphabetical or categorized listings on a regular basis.

8. Evaluation of thesaurus

Based on the work performed in earlier tasks, the East-West Center's thesaurus will be evaluation to determine its appropriateness to the NEIC's needs. This will be done by formal means, such as trial retrievals from the card catalog. It will also be done on an informal basis, by noting comments from NEIC personnel and users. The results of this evaluation will be examined and it will be determined whether the thesaurus should be adopted, revised for NEIC's use, or replaced by an alternative thesaurus.

9. Preparation of data and input to computer

The data will be prepared for computer input and keyed according to input specifications. All data will be verified and proofread to ensure accuracy for storage and retrieval of the bibliographic information.

10. Processing via ISIS system

The data will be input to the ISIS system at NSO and necessary listings and bibliographies will be generated. A schedule for this processing will be devised to satisfy the requirements of the NEIC, with NSO's approval.

Schedules for year 1 are presented on the following two pages. It may be assumed that, for data activities, Tasks 2, 3, 4 and 5 will be performed on a continuing basis. For library activities, Tasks 3, 4, 5, 6, 8, 9 and 10 will be performed throughout the program.

VI. Schedule for Data Activities, Year 1

Task	Months
	0 1 2 3 4 5 6 7 8 9 10 11 12
1. Personnel identification and selection	
2. Inventory of data files	
3. Identification of non-NEA data	
4. Processing data	
5. Preparation of computer input	
6. Processing via computer system	

VII. Library Activities Tasks and Schedule, Year 1

Task	Months
	0 1 2 3 4 5 6 7 8 9 10 11 12
1. Personnel identification and selection	
2. Inventory of library holdings	
3. Cataloging/indexing of present collection	
4. Identification of relevant non-NEA information resources and establishment of organizational relationships	
5. Preparation of directory and referral service	
6. Selection and acquisition of new materials	
7. Cataloging/indexing of new materials	
8. Evaluation of thesaurus	
9. Preparation of computer input	
10. Editing, proofreading of all library data	

Task	Months
	0 1 2 3 4 5 6 7 8 9 10 11 12
11. Processing via ISIS system	(5 → 12)

VIII. Consultants

Consultants are required for all developmental aspects of the NEIC and for review of the center's operation. The consultants will ensure that (1) sound procedures are developed and followed during the processing of NEIC materials, and (2) technology is being applied appropriately. It is important from standpoints of economic and operational efficiency, that the proper amount of information and computing technology should be applied at the proper time. This includes the revision of uses of technology, if required. The consultants will also be responsible for training NEIC personnel and in updating them in new procedures, when appropriate.

The primary systems design and implementation consultant is required on a more frequent basis during the first year than will be required later on. It is recommended that this consultant should be on-site for approximately one month during the third-to-fourth months, eight-to-ninth months (depending on the state of development during the seventh month), and twelfth-to-fourteenth months of the program.

The library processing and systems consultants are required primarily during the first six months, to train the library staff in ISIS procedures and to serve as a resource for cataloging and indexing tasks as well as for guidance in ISIS input preparation later on in the first year. These consultants should be available on a one-fifth time basis. The AIT library has agreed to furnish consultants who have been processing their materials, some of whom are energy specialists and some of whom speak Thai. They will be available to visit NEA for training and review sessions, initially, twice a week and later on a less frequent basis.

The data management systems consultants are required to advise on the computer applications other than ISIS. These consultants will make sure that data processing activities are coordinated to make optimal use of the available data files and the computer systems' capabilities. These consultants will be required on a one-fourth time basis throughout the first four years.

Library processing assistants and energy subject specialists will be required on a short-term basis, to perform the cataloging and indexing of the present library collections at NEA. During the first six months, six person-months each of library assistants' and subject specialists' time will be required, for a total of twelve person-months.

IX. Computer Facilities

Extensive investigation into the availability of computer facilities in Bangkok has resulted in the recommendation for the EDCT to use the National Statistical Office (NSO) computer center. The NSO computer is an IBM 3031 with remote capability. In addition, the center is approximately five minutes by car from the present NEA location. The basic computing capabilities required by the NEIC are presently available at NSO. Another NEA division has requested approval for terminal equipment to be used with the NSO computer. It has been approved by the subcommittee of the National Computing Committee and further approval is anticipated, to allow installation by September 1981. This would allow the NEIC to be connected to the NSO computer by acquiring only terminals and printing equipment. Modems and telecommunications would already be available.

It is recommended that, during the first six months, NEIC work should be performed at the NSO location. However, during the second six months, a terminal should be installed at the NEIC, to provide autonomy of the computer's use for input, and to provide immediate access to the data to be retrieved for NEA, especially for policy-related matters. During the eighteenth thru twenty-third months, when NEIC is operational and has had experience with their data systems, an additional remote station might be installed at the Cabinet rooms, to allow the Regulatory Division to display graphically the projections derived from the data in their files.

At this time the only terminals available in Bangkok which are found to be well maintained by their manufacturers are those from IBM. Unless other terminals become available during the next six months to one year NEIC will have only one option, to use the IBM terminals and related equipment. It is recommended that the equipment should be leased, primarily because of the rapidly changing technology and related innovations. The terminal and related costs (lease prices) for equipment required for NEIC to be connected to the NSO computer, are tabulated at the end of this section.

It should be noted that, by Year 3 of the program, there should be lower priced terminals and teleprocessing capability available in Bangkok. This would reduce the complexity of equipment required (e.g., modems) and the related costs.

An optional approach is to wait until lower-priced equipment is available. However, this would be likely to result in delays in getting the NEIC to be operational. A central processing station readily accessible at the NEIC will be an important factor in the coordination of the activities and the productivity of the center.

Since it is unknown when other-than-IBM terminals will be available along with satisfactory service and maintenance facilities, this plan cannot include projections for conversion to less costly equipment, although it is assumed that within five years such a conversion would be feasible.

Therefore, the recommended approach is to consolidate all computer activities, maximize the use of data and related systems, and within one year, acquire via lease the necessary equipment for a remote terminal at the NEA. All IBM equipment and IBM-compatible software will be used. At the first opportunity to lease less expensive equipment and/or software, they should be acquired to replace the IBM equipment.

Regarding the use of the al-EDIS system, more information is required to determine the various types of hardware that can be used. If the minicomputers available for use with the system are among those which are not presently available in Bangkok, then that system should not be acquired at present. A similar system which is presently available is the QBE system, mentioned above, which can be leased for approximately 9,000 ฿ per month. That system can be used immediately on the NSO computer. Since NSO is considering QBE for other applications, it is likely that it will cost even less for NEIC to use.

As soon as al-EDIS hardware is available and serviced in Bangkok, it should be reconsidered via a comparison of costs (purchase price of al-EDIS hardware, software, and training is $ 225, 000 or 4,500,000 ฿) and system capabilities. It should also be determined how many of NEIC's standard data processing functions the hardware could perform. Based on the results of that analysis, the decision can be made as to whether the al-EDIS system might be cost-effective and its capabilities required, e.g., in place of the QBE system.

It is likely that some of the software packages listed above will be available free through NSO. Also, the Systems Analysis Branch of the Investigation and Planning Division have requested a station on-site at NEA. It is possible that, in the future, the modems might be shared by the NEIC and the Systems Analysis Branch. This would represent a significant cost savings. The Regulatory Division and the Investigation and Planning Division need to explore the possibility of shared equipment.

X. Data Systems

At present there are a number of data processing activities going on within the Regulatory Division. It is recommended that, initially, data systems presently used or presently available at NSO should be used. Then, during the second six months, IBM's QBE (Query-By-Example) package can be used. QBE is an interactive management information system which can be operated easily by non-data-processors. It provides data extraction capabilities; data sorting, selecting, and manipulating functions; data creation and maintenance; and interactive browsing and display. It provides for tabular format. Applications can include consumption tracking, production planning, resource allocation and management, and forecasting. The costs for this system are included in the summary on the next page.

Equipment Costs
(baht)

Item	Quantity	Monthly Lease	One-Time Charge	1st Year Costs*	2nd Year Costs*	3rd Year Costs*
3270 Series CRT (English, with control unit)	2	2,400	50,000	157,600	57,600	57,600
Matrix Printer	1	6,000	54,000	90,000	72,000	72,000
5796/PKT QBE	1	8,220	-	-	49,300	108,000
5734/LMS PL/I Transient	1	760	-	4,600	8,100	4,100
				252,200	187,000	241,700

* Includes one-time charge

XI. Library Systems

The recommended approach for library computer applications is to use the National Statistical Office computer center's forthcoming library. The ISIS system for bibliographic storage and retrieval will be installed at NSO during the next three months. It will be available for use by the EDCT. This will require only the preparation of bibliographic information on the NEA libraries' holdings according to the ISIS formatting specifications, with subsequent input to the NSO/ISIS system. No programming will be required.

Initially the present bibliographic records will be input and a library holdings list will be generated. Then, on a bimonthly schedule, citation of new acquisitions will be prepared and input to the system. Monthly supplements to the holdings list will be prepared. The list will be revised on a quarterly basis.

It will be necessary to request immediately the use of the NSO/ISIS since an already approved application will be requiring alot of the systems capacity. In addition, NEIC's requirements must be made available to NSO so that the system will be installed to accommodate NEIC.

XII. Office Facilities and Equipment

The NEIC facility will be located at the NEA Regulatory Division. It will be housed in 140 square meters of space which will be divided into two rooms. It will require the following furnishings and equipment:

Item	Year 1	Year 2-4	Total
Desks	5	3	8
Desk chairs	5	3	8
Library table	1	-	1
Library chairs	6	-	6
Work tables	3	2	5
Chairs (for work table)	3	2	5
Reception table	-	1	1
Reception chairs	-	2	2
Typewriter tables	1	2	3
Filing cabinets	6 ln. meters	6 ln. meters	12 ln. meters
Library shelving	12 ln. meters	12 ln. meters	24 ln. meters

Item	Year 1	Year 2-4	Total
Typewriters	1	2	3
Copying machine	1	-	1
Telephones	3	-	3
Chalk board	1	-	1
Bulletin board	1	-	1
Miscellaneous office equipment	------------ as required ------------		

XIII. Photocopying Equipment

The EDCT will require a photocopying machine. It is recommended that one Fuji Xerox 2202 machine should be used for the first two years. The volume of copying is estimated to be approximately 1,100 copies per month during months 6-12 of the first year. It is anticipated that the usage will double during the second year, and increase by at least 50% during the third and fourth years. By the third year, a larger machine such as the Xerox 4600 should be installed. It has a photoreduction feature which will be useful to the center, especially for use with computer printouts. It operates at a higher speed and has some additional features that will be required as photocopying requirements of the EDCT are increased.

It is assumed that the EDCT will charge non-NEA users for photocopying services and for document purchase, at the cost for the service.

XIV. Costs

The projected costs for the first four years of the EDCT are as follows:

Item	COSTS ($US)				
	Year 1	Year 2	Year 3	Year 4	Totals
Librarian	4,000	9,000	10,000	10,000	33,000
Consultants					
M. J. Ruhl	12,100	24,200	(as needed)		36,300
Library Systems	5,000	5,000	4,000	3,000	17,000
Data Systems	2,000	5,000	5,000	5,000	17,000
Library Specialists/Energy Subject Specialists	4,000	4,000	-	-	8,000
Books, Materials	5,000	10,000	10,000	10,000	35,000

Item	COSTS ($US)				
	Year 1	Year 2	Year 3	Year 4	Totals
Special Office Equipment					
Copying Machines	1,000	3,000	6,000	6,000	16,000
Computer Terminals & Related Equipment	12,600	9,400	12,100	12,100	46,200
Travel and per diem	12,100	--------	18,700	--------	30,800
Contingency (on avove)	6,300	--------	34,600	--------	40,900
Contingency, additional contingencies					
1) No existing NEA-NSO remote capability (includes terminal, control, modems, leased line)	14,000	10,000	10,000	10,000	44,000
2) Terminal at Cabinet room (includes terminal, modems, leased line)	-	13,000	11,000	11,000	35,000
Total	78,100	--------	281,100	--------	359,200

(includes USAID and DTEC contributions)

Recommendations for Use of ISIS

It is recommended that the NEIC should use the ISIS system for library processing, production of bibliographies, and general searching.

Input

It is further recommended that NEIC should adopt the format used for the Asian Information Center for Geotechnical Engineering (AGE) which can include keywords selected from a thesaurus as well as subject classification codes, both requirements for NEIC.

Output

NEIC will require the following products from ISIS:

- acquisitions lists by author and title, on a monthly basis;
- bibliographies of all acquisitions including author (personal and corporate), keywords, and country indexes;
- selective bibliographies to be selected by keywords or classification codes, to be issued as required;

- selective retrieval in response to individual inquiries, to be performed as required.

The last three products listed above should have optional formating capabilities, i.e., any combination of fields should be able to be selected, even though those products produced on a regular basis should have a set format such as that used for Asian Geotechnical Engineering Abstracts.

Annex III

EVALUATION OF COMPUTER REQUIREMENTS OF THE NATIONAL ENERGY ADMINISTRATION (NEA) AND THE NATIONAL ENERGY INFORMATION CENTER (NEIC)

February 1983

THEATHO (THAILAND) COMPANY LIMITED
Consultants and Engineers

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INTRODUCTION

The success of any computer system installation is directly dependent on the amount and quality of the planning that precedes its insta .ation.

INTRODUCTION TO THE NATIONAL ENERGY ADMINISTRATION

The National Energy Administration (NEA) is responsible for assisting in the energy planning for the Royal Thai Government. For the purposes of this report, we have subdivided the NEA into two separate parts: The National Energy Information Center (NEIC), and the remaining parts of the NEA.

THE NATIONAL ENERGY INFORMATION CENTER

The NEIC has the responsibility to provide information on energy to those requesting it both within NEA, as well as from outside. To provide this information the NEIC must collect and provide statistical, technical, and other related information on energy resources. They are expected to provide basic library and information services, including the provision of providing books, reports, journals and other documents, using procedures as standard as possible. The ability to exchange information with outside sources is considered very important, so that the ease which information is transferred is important. The reqirement to have on-line retrieval of information is also considered to be very important.

Secondary NEIC uses for the computer include the possible use of the computer to produce information which will be sent to a number of sources at one time. The quality requirements are low, and photo-copy reproduction of standard computer produced printouts would be adequate.

THE NATIONAL ENERGY ADMINISTRATION

The NEA requires computer facilities to conduct it's energy planning and research. It currently has an IBM 528X micro computer, which is linked through dedicated telephone lines to the National Statistical Office (NSO). This system is able to provide only a limited amount of the computer resources which the NEA requires. The NEA also is using the IBM computer at the Asian Institute of Technology (AIT) for some of it's energy modeling programs.

Some of the applications which the NEA is currently running include:

-Electric power transmission analysis.

-Analysis of water flow.

-Petrol usage analysis.

-Data base of hydro information (numerical)

-Project analysis and evaluation.

This report has been prepared to assist in effectively planning solutions to installation problems. It is based on Theatho's extensive experience in both the installation and operation of computer installations. It presents ideas that have been tested by time. The material included should be of value not only at the time of installation but also at the times when the computer system is being expanded and improved.

Theatho is aware of the strategic importance of preinstallation planning. Our policy is to make available to our customers professional assistance in the steps that lead to installation of a computer system. This usually begins with a feasibility study. It continues with the availability, at a charge, of applications and systems engineering services to assist our customers with specific data processing tasks, including integrated systems design, applications program design, program design and development, and conversion and implementation planning. Application and systems engineering services are performed by trained Theatho system engineers equipped with various equipment, programming, systems, and applications skills. Theatho also provides data processing education for the training of customer personnel.

Each computer installation is unique to some extent. Installations vary in size as well as in application, and the overall situations into which they fit can be quite different. For this reason very little reference to specific detail can be made without a complete investigation of the requirements, needs, and resources of the customer.

While a few important factors may be unique to a particular installation, most aspects of installation planning are common to all. The general principles that apply in all or most cases provide broad guidelines that must then be adjusted and tailored to satisfy the particular needs of a specific installation. This report has been written with the needs and requirements of the National Energy Administration (NEA) and the National Energy Information Center (NEIC) in mind.

Some of the forms shown in this report have been developed and are being used in operating computer installations worldwide. They have been included here as examples to assist a new user develop forms for his own special requirements.

This report is not intended to substitute for the great variety of other publications pertinent to specific problem areas dealing with the computerization of specialty fields such as found in your field of interest, etc. Many different publications may be requested through your local Theatho office, and local book sellers.

THE DATA PROCESSING ORGANIZATION

Because of the vast differences among organizations in size, type of organization and organization philosophy, it would be presumptuous for anyone to prescribe a single data processing organization for every case. However, experience has taught at least two general lessons. The first in that a successful data processing organization requires full and active support from management. The second is that within the data processing organization certain specific functions must be assigned as the definite responsibility of particular individuals.

MANAGEMENT PARTICIPATION

Acquiring a computer system is far different from the acquisition of standard office equipment.

The extensive changes in systems and methods, individual responsibilities, and the large potential for cost savings and profit that result make it important that top management approve, direct, and coordinate the undertaking of computerization. Accordingly, the head or manager of the computer installation normally reports directly to the managing director, or some other staff officer assigned the responsibility for data processing and planning.

The computer manager is usually assigned full responsibility for the computer system. He is an operating executive with the direct authority and responsibility for planning the applications, selecting equipment, and installing the system, as well as for operating and maintaining the system once it is installed.

He receives assistance from his management for overall planning, ironing out interdepartmental conflicts, making desirable changes in Department of Energy Administration policy, and for budgetary control.

All of the above does not preclude that the computer installation manager does not hold another position in the organization. In many of the smaller organizations it is most common that the computer manager is also a manager in one of the other departments of NEA.

FUNCTIONS.

Setting up an efficient computer installation demands a clear understanding of each of the major functions to be carried out.

These functions should eventually be assigned as the responsibilities of specific individuals or groups.

For convenience the various functions may be divided into two groups -- those that must be performed before the physical installation of the computer system, and those that come into being after the system has been installed. However, PLANNING for all of these function takes place before installation. The first group will be considered under the heading of Planning and Development; the second, under Operations.

The following represent Planning and Development functions.

ANALYSIS OF SYSTEMS.

This involves the survey or study of existing NEA operations to determine their applicability and profitability by using computerized systems. It further involves the definition of applications (new and old) in sufficient detail to enable others to complete their preparation for the acquisition of the computer system.

PROGRAMMING.

Once an application is defined it must be designed in detail with respect to the computer equipment involved. THis means that system and program flowcharts should be prepared. The application then may be coded (written in a computer language) or if possible purchased as a package program which is complete and ready to use. When this has been done, it may be tested, and properly documented for its use in the data processing installation.

LIAISON.

A close working relationship MUST be maintained between those doing the programming and those who are most intimately acquainted with the various requirements and procedures of a particular application.

PROCEDURES AND DOCUMENTATION.

The installation of a computer system will cause changes in the operations of both the departments supplying data to the the computer system and those working with the systems results and reports. The establishment, clarification, and documentation of that must be performed. Programming and documentation techniques, standard program routines, and work procedures must be established as data processing policies or standards.

CONVERSION TO COMPUTERIZED SYSTEMS.

Planning and effecting an orderly conversion from existing methods to those of the computer system, has received far too little attention in the past and has created needless difficulties in installing data processing systems.

The following represent functions that are essential to the operation of a computer system.

Supervision and Management.

Once applications have begun to be handled on the system, responsibility for successfully running and maintaining them should be assigned to an operations manager. This responsibility will include supervision of operating personnel, scheduling operations, controlling input data, and disposition of output data.

Scheduling.

All work must be carefully scheduled in advance. This is essential if conflicts are to be avoided and deadlines met. Auxiliary equipment such as printers etc. must also be scheduled.

Controls.

System controls will have to be maintained, with emphasis on security where ever required. The receipt and disposition of input and output material will have to be controlled.

Library Control and Maintenance.

The responsibility for control (issue, receipt, and storage) of magnetic tape reels, disk packs, diskettes, program listings and input, and operating records must be assigned. This is often the duty of the librarian. In small installations this person will often assume other duties such as secretary, receptionist, etc.

Program Maintenance.

It is sometimes the responsibility of the operating group to maintain existing applications programs. This includes correcting program deficiencies (usually errors of omission in handling unusual situations), making requested changes to existing programs, improving programs, writing small, often one-time routines, etc. In small installations the users may be assigned this responsibility. In larger installations there may be a staff of several who assume this function as a full-time responsibility. Obviously this function cannot be performed until the operations manager has received a well documented and checked-out program from the supplier or the programming staff, and has accepted responsibility for running the program.

Application Conversion.

During the conversion of an application to the computer system, files must be created, pilot operations run, etc.

Documentation.

Operating records must be kept and any changes to programs or procedures must be documented.

Demonstrations and Training.

Both public relations needs and educational needs must be meet.

SELECTION AND EDUCATION OF PERSONNEL.

The selection and education of personnel capable of effectively performing the functions listed in the previous section are of great importance. The success of the computer installation will depend to a great degree on the people as upon anything else.

Selection.

Data processing personnel should have considerable general intelligence and should possess certain specific aptitudes. The measurement of these aptitudes may to some extent be accomplished with the assistance of Theatho's evaluation department.

Equally important factors merit consideration. Among these are such matters as the experience and past performance of the individual being considered, his educational qualifications, his interest in data processing, his knowledge of those areas being considered for data processing applications, and so on.

Classroom Training.

Once personnel have been selected they must be trained. Education in the field of data processing is imperative when considering installation of data processing equipment. Executives responsible for making the decision must be able to evaluate the effects of a computer installation on the NEA. Theatho offers executive-level courses at plant sites and education centers to fill these requirements.

A more extensive education is required after the decision to install a computer system is made. Full coordination with Theatho is recommended to obtain the full benefits of training of computer personnel.

On-The-Job Training.

After completion of course (formal) study, a continuing program of training while performing duties should be used.

As the application analysis procedure and programming effort press forward, personnel will become increasingly more proficient.

The librarian's education will consist mainly of the procedures used in maintaining the program library. However sufficient training on the data processing system and the application of it should be give to enable him to communicate intelligently with others in the computer field.

The users must be given training on the usage of each of the applications as well as the operation of the specific equipment which they will be expected to operate such as consoles, terminals, printers, etc.

Education of other Personnel.

Some attention must be given to the education of persons not immediately involved in the data processing installation. This includes personnel of departments whose procedures affect or are affected by the data processing system. There may be changes in data arrangement, or data may be deleted or added. It may be prepared or disposed of in new ways. The new procedures must be made clear to all personnel who will be working with them.

It is important to communicate with other employees regarding the data processing system because there is usually a great deal of curiosity regarding this. Organized presentations, with visual aids, give to different groups within the NEA, should be considered. It may be helpful to make up a brochure explaining the purpose of the data processing system and its general tendency to create more challenging jobs.

PLANNING AND PROGRESS CONTROL.

The installation of a data processing system requires that a great many related activities be carried out. It is important that these activities be carefully planned and scheduled. Schedules should be established as realistically as possible by the data processing manager. They will naturally be subject to change as the detailed studies and programming get under way. Frequent reviews should be made and action taken where necessary to assure that the entire program progresses in an orderly and integrated manner, and that the date scheduled for installation will be met.

Three types of schedules will be found to be useful:

- General Preinstallation
- Applications Development
- Program Development

GENERAL PREINSTALLATION SCHEDULE.

This schedule is established to control progress toward the installation date. It will set up target dates for all major activities such as the following:

Establishing the data processing organization
Selection and education of personnel
Standards development
Systems design
Applications definition
Programming and testing of applications
Conversion planning
User training
Physical installation planning
File conversion

The use of a flowchart for visualizing the interrelationships among the many activities can be quite useful. The chart given provides a rough time scale while serving as a checklist of essential activities. The exact sequence and flow can be modified to suit the individual installation requirements.

PERT charts may be advantageous in large or complex installations if a great variety of equipment and skills must be blended to converge at the time of installation.

APPLICATIONS DEVELOPMENT SCHEDULE.

This schedule is helpful in controlling and showing a broad picture of programming progress. All programs are listed in the left column and can be grouped by application. Across the top of the chart, calendar periods are shown starting with a date some number of months before the delivery date. The lengths of the period and the amount of total time involved may vary, depending on the nature of the programs and the type of data processing system involved.

PROGRAM DEVELOPMENT SCHEDULE.

This chart is the most detailed and consists of all activities necessary in connection with the preparations of each application program. It may used as a suggested checklist as well as a schedule. It should help to assure that no important details of the applications program are overlooked.

MANPOWER AND PROJECT ASSIGNMENT.

A critical function in planning and controlling progress is the assignment of personnel to to various preinstallation activities. It is virtually impossible to set a rule of thumb for determining the amount of manpower that will be required to program and install a data processing system. The number of people required will depend on the complexity of the application, the caliber of personnel, the previous method of doing the job, the number of applications programs to be prepared, and on whether it is a first and only system or an additional system.

Programming manpower can at times be shared with installations at other locations. Some organizations maintain a centralized staff for all programming. Only an evaluation in the light of the particular circumstances involved will produce a usable estimate of personnel requirements.

There are three methods that can be employed in assigning manpower to applications projects. One method is to assign a given application or program to one person to follow through from start to finish. The advantage here is that only one person carries the entire train of thought. A second person, however, should review the general and detailed flowcharts. The coding for error and end-of-file routines, checkpoint and restart should be reviewed by those responsible for data processing methods.

There is also a decided moral advantage in giving an individual a project which becomes his full responsibility. It gives him an important goal to work toward, one with which he can honestly identify himself and toward which he can therefore strive. His own sense of worthiness and pride in achieving such a goal will be further supported by recognition from others

This approach also has the advantage of being a good method for determining the aptitudes and capacity of each individual who will be involved in the computer installation project.

A second method of making assignments it to assign one application project to two or more individuals, a team, whose members will work together to develop the applications program. It is recommended that one person on each team be appointed as head leader. The advantages here are:

1. Dependence on the presence, ability, and knowledge of one person is eliminated.
2. Progress toward completion is usually faster and steadier.
3. Better programs will normally be produced when more than one person has thorough knowledge of the application.

There is also a definite advantage in having more than one person completely familiar with a program during the testing and conversion phases.

This team method is to be highly recommended, particularly during the initial stages of the preinstallation period. After the effectiveness of the various individuals can be assessed the programming teams should be regrouped. By this time more will known regarding such matters as the specific abilities of individuals, their availability, the job complexity, the size of the programs, and how long they take, and the extent to which problem definition has been completed, etc.

A third method of making assignments is to have one person do the defining and flowcharting and have another person do the coding and testing. This method, less frequently used than the others, has the advantage of familiarizing more than one person with the program. It therefore enables some flexibility in assigning activities. For example, senior programmers or systems analysts could turn over their definitions and flowcharting to new programmers and could then begin immediately on other applications programs.

This method requires that defining and flowcharting include extensive detail and accompanying notes so that documentation will be clear to the programmer. Also, the person who did the flowcharting and the one who does the coding must work near each other so that any questions that may arise may be settled without delay.

In planning personnel assignments it is helpful to draw up a Manpower Loading Schedule. This type of chart shows, at a glance, each person's specific assignment by a job number designation. It also shows those who are scheduled longest, and who will be available first for new assignment. If no one will be available for an assignment that must be made at a certain date, this will be evident. In this event the chart establishes the need for an increase in manpower.

It is evident that a projected manpower schedule is dependent upon the actual development of the work to which personnel have been assigned. Thus, as information regarding work progress is posted to the Applications Development Schedule and to the record of progress chart, it may be necessary to revise the Manpower loading Schedule.

PROGRAM DEVELOPMENT SCHEDULE

		14	13	12	11	10	9	8	7	6	5	4	3	2	1	WEEKS BEFORE INSTALLATION
1	APPLICATION ANALYSIS:															
2	WRITTEN															
3	REVIEW															
4	APPROVAL															
5																
6	PROGRAM:															
7	SELECT LANGUAGE															
8	OPERATING SYSTEM															
9	FILE ORGANIZATION															
10	GENERAL FLOWCHARTS															
11	DETAILED FLOWCHARTS															
12	SELECT UTILITIES															
13	PRIORITIES ESTABLISHED															
14	MACROS SELECTED															
15	FILE MAINT. ESTABLISHED															
16	REPORT REQUIREMENTS EST.															
17	STORAGE ALLOCATION															
18	INTERNAL CONTROLS EST.															
19	I/O CONTROLS ESTABLISHED															
20	PROGRAM TESTS DESIGNED															
21	PROGRAM TESTED															
22	PROGRAM REVISED															
23	PROGRAM TESTED															
24	CONVERSIONS COMPLETE															
25	PROGRAM OPERATIONAL															
26																
27	OPERATIONS:															
28	PERSONNEL TRAINED															
29	PROCEDURES WRITTEN															
30	SCHEDULING COMPLETED															
31																
32																
33																
34																
35																
36																
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38																
39																
40																

APPLICATIONS DEVELOPMENT SCHEDULE

DECEMBER 1982

			JAN		FEB		MAR		APR		MAY		JUN		JUL		
1	FORECASTING	JONES	A	F		C			D	T							
2																	
3	COST ALLOCATION	"			A		F	C		D	T						
4																	
5	PAYROLL	"	A		F		C		D	T							
6																	
7	QUALITY CONTROL	SMITH				A	F	C			D	T					
8																	
9	MIS	WOOD	——	NEW	EMPLOYEE				A		F	C			D	T	
10																	
11	SHIPPING	SMITH	A			F	C	D	T								
12																	
13	ACCOUNTS	FOX	V	A		F	C			D	V	V	T				
14																	
15	CASHFLOW	JONES		A		F		C		D	T						
16																	
17																	
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40																	

A: ANALYSIS F: FLOWCHARTING C: CODING D: DESKCHECK T: TESTING V: VACATION/LEAVE

RECORD OF PROGRESS

DECEMBER 1982

	PROJECT:	TEAM:	PROBLEM ANALYSIS	START DATE	GENERAL FLOWCHART		DETAILED FLOWCHART		PROGRAM CODING		PROGRAM TESTING		DOCUMENTATION		TARGET DATE	TOTAL DAYS	REMARKS
1	FORECASTING	JONES	5	1 JAN	15		6		30		10		25		15/5	91	1-2-3-8
2	COST ALLOCATION	"	12	1 FEB	6		3										1-2-3-8
3	PAYROLL	"	22	1 JAN	12		9										1-2-3-8
4	QUALITY CONTROL	SMITH	9	15 FEB	5												4-6
5	MIS	WOOD	30	1 APR	9												5
6	SHIPPING	SMITH	45	1 JAN	6												4-6
7	ACCOUNTS	FOX	28	15 JAN	5												7
8	CASHFLOW	JONES	12	15 JAN	12												1-2-3-8
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NEA/NEIC Computer Evaluation

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MF IPOWER LOADING SCHEDULE

	NAME:		J 1	J 15	F 1	F 15	M 1	M 15	A 1	A 15	M 1	M 15	J 1	J 15	J 1	J 15	A 1	A 15	S 1	S 15	O 1	O 15	N 1	
1	Jones (1)	SCHEDULED	X							X														
		COMPLETE	o																					
2	Jones (2)	SCHEDULED			X						X													
		COMPLETE																						
3	Jones (3)	SCHEDULED	X							X														
		COMPLETE		o																				
4	Jones (8)	SCHEDULED		X							X													
		COMPLETE																						
5	Smith (4)	SCHEDULED				X						X												
		COMPLETE																						
6	Smith (6)	SCHEDULED	X						X															
		COMPLETE	o																					
7	Wood (5)	SCHEDULED							X							X								
		COMPLETE																						
8	Fox (7)	SCHEDULED		X								X												
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15

SOFTWARE ALTERNATIVES AVAILABLE TO NEA.

The most major constraint in the selection of a computer system for NEA and NEIC is that of software available, which for NEA and NEIC is very specialized, and only available from a limited number of sources.

Only a few software packages are able to produce the results which are required for the information retrieval system for the NEIC. The major packages, which run on American made computer equipment are ISIS, a large, complex library information system which is designed for use on the large IBM series 370 main frame computers, and MINISIS which is modeled after ISIS, and runs on the HP-3000 mini-computer. The primary disadvantage of MINISIS being the fact that it will only work on a HP-3000, being written in a language which only runs on and was developed for the HP equipment.

There are several data base software packages which might give suitable results for NEIC, most of which run on the now popular micro-computers. However they would require major rewriting or alterations before they would be of any use for the NEIC applications. This would, in the present environment, prove to be both very difficult as well as expensive as outside assistance would have to be used in the conversion of these software packages. The customization of available software by NEA or NEIC should at this time be avoided if at all possible.

There are also several systems available for which there is no information currently available. When additional information, or systems, become available NEA and NEIC should investigate each of them, to determine if the system could be applied to the projected requirements of NEA and NEIC. Theatho will also provide any information received in the future to NEA and NEIC of such systems when it is made available.

HARDWARE ALTERNATIVES AVAILABLE TO NEA.

There are several alternatives open to the NEA for the computerization of NEA and NEIC. Each of these alternatives will be discussed, and their relative advantages and disadvantages will be examined.

Though there are possible alternatives other than those discussed here, they were ruled out initially as they failed to meet some or all of the specifications laid out by the NEA. Each of the alternatives discussed here have, in fact, been examined at some time by the NEA.

There are several criteria which the possible alternatives have been considered for NEA and NEIC. These criteria included:

A) Will the system work: Is this alternative technical feasible, will it perform as a computer facility.

B) Is the system feasible economical: there are several alternatives which will be technically feasible, but are however,not economically viable, as the cost of equipment and/or support exceeds the desired value of the result.

C) Does the system meet the specifications which NEIC and NEA have indicated. Systems may be physically feasible, cost effective, but unable to do the work which NEIC and NEA has planned for it. Some of the requirements which NEIC has indicated for the computer include:

1) The ability to provide on-line inquiry for research purposes. This on-line requirement will be a full time.

2) Costs should not exceed US$120,000.

3) Some of the desired results include:

-Storage/retrieval of information.
-Report generation.
-Minor publication requirements.

4) Data base size will initially be about 2,000 to 3,000 records. The data base is expected to grow at a rate of about 1,000 records per year, to a final size of 5,000 to 7,500 records.

5) Basic compatibility with the recognized international standards for library data processing. (It should be noted that no system meets all of the standards, however there are several which will be satisfactory for the NEIC system).

USAID has also imposed limitations on the selection of equipment, due to funding constraints, being that the selected equipment should be of American manufacture.

INHOUSE HP-3000 MINICOMPUTER.

The first alternative, which is considered to be the best is that of installation of an Hewlett Packard (HP) model HP-3000 Mini-computer. Advantages to this system include:

1) Software is available in a readily usable format. Most important is the availability of MINISIS, a software package which is specially designed for the types of applications which NEIC requires (see the section on software availability).

2) There are a large number of users of this system, including several in Bangkok. It can be expected that there will be more in the future. They will be able to provide numerous data bases and other software etc. for NEA and NEIC from both within and their outside Thailand.

3) The equipment and its maintenance is available in Bangkok, from a reputable company. The HP equipment requires a minimum of space, and will perform a number of functions for NEA and NEIC.

Disadvantages included some of the following:

1) The system will be unable to do all the tasks which the NEA wishes to do inhouse. Most of the packaged programs which are used on the Master Energy Plan will not be usable on the HP equipment. Future software which may be developed here by NEA for the MEP will be usable on this equipment.

2) There probably can be no direct link(s) with other computers due to the differences in the manufacture of the equipment. There is a possibility that there can be some indirect data communications, either using modems or diskettes though. Data transfers by diskette or tape is generally considered to be feasible at this time.

LINK TO NSO's IBM SYSTEM/370 COMPUTER

The second alternative is to link to the NSO IBM System/370 computer. There are several advantages (and disadvantages):

1) The system is large, and able to handle most if not all of the NEA's requirements for computerization at this time.

2) The hardware for linking to the system is already installed, and operational, including telephone lines.

3) There is already some support equipment installed including

-Printer, dot matrix type.
-Terminal
-Diskette facilities
-Communications facilities.

4) ISIS is already running on the NSO system on a limited schedule. There is some effort to increase the performance of ISIS at NSO at this time.

The disadvantages of using this system are few, however they are also very serious.

1) The NSO system does not have, at this time, the necessary support personal for their system. There is only one qualified systems programmer who is responsible for the maintenance and operation of the entire system for both NSO and outside users.

2) NSO will not be able to run ISIS or CICS for more than one or two hours per day. Their requirements for the computer facilities, as well as certain operating system restrictions make this necessary. This would not allow for online operations which NEIC has indicated are required.

3) NEA and NEIC will have no control over NSO. Were any problems to arise, they would assuredly be without computer facilities, possibility for an extended time or permanently.

The second disadvantage would however serve to eliminate the NSO system from consideration at this time.

LINK TO AIT's IBM SYSTEM/370.

The third alternative, that of using the AIT's Regional Computer Center, is the last one to be discussed. The advantages include:

1) The system is large and already has ISIS running during office hours. This system is considered to be one of the best maintained ones in the world.

2) The system is also well supported by AIT and IBM, and would be a most reliable alternative.

3) AIT has indicated that there would be no problems with their system. They also, by nature would be 'interested in providing the services, as these would benefit Thailand, as well as the region and AIT.

4) There is already support equipment installed, see item 3), above, under advantages for the NSO installation.

However some of the disadvantages include,

1) There are no remote communications to the AIT computer. The Telephone Organization of Thailand (TOT) does not, at this time, have proper facilities for providing this type of communications. The TOT has not indicated that it would be able to provide these facilities in the past, and as basic telephone service to AIT is very limited in its performance, this indicates that the more exacting requirements of computer communications would be difficult to meet. If the TOT were to attempt to install communications equipment, there is also no guaranty that they would be able to maintain it. There were also serious problems with installing the connection from NEA to NSO, a distance of a few hundred meters.

2) The majority of the equipment at AIT is on loan from IBM. If the type of equipment should be changed, NEA and NEIC could find itself without proper or functional facilities for software which will only work on large scale IBM equipment.

The first disadvantage however rules out the AIT computer system from consideration at this time.

GENERAL FACTORS FOR CONSIDERATION.

There are several factors which require consideration in the installation of any computer facilities at NEA. These were covered in the introduction, and will be review them here.

Environment.

There are several environmental constraints for computer equipment:

Space: There must be sufficient space to permit the equipment to be operated and maintained in an efficient manner.

Temperature: The area which the computer is operated must have its temperature maintained to within a specified range to prevent overheating and premature failure of equipment. This range is normally specified by the supplier of the computer equipment.

Humidity: The amount of water in the atmosphere must also be controlled, either by the air-conditioning equipment, or by additional de-humidifying equipment.

Floor loading: The allowable weight which a floor will carry is an important factor. It is considered unacceptable to have computer equipment fall through the floor.

Access: If the computer equipment will not fit in the door, go up in the lift or stairs, it will be difficult to use it in the intended location. Some computer equipment is very large and heavy, and is very difficult to move. If a large installation is made, serious consideration should be given to setting up the computer center on the ground floor of a building.

Staff.

Programming: Each of the alternatives presented above have various levels of required staff. Some will require several competent systems programmers/systems analysts.

Usage.

To permit efficient usage of the computer equipment, the correct number of units, such as terminals, printers etc. must be selected. We estimate that NEA and NEIC will require 4 terminals, probably to be used in the following manner. One will be attached to the computer system directly, and be located in the computer room. This terminal will be used to monitor the system, and may also be used for other uses such as programming for NEIC. A second terminal will be used in the library for NEIC's use in data entry and retrieval. A third will be for NEA's use in the hydro department for planning. The fourth will be required for the NEA's EDP department use.

COST ANALYSIS OF SELECTED SYSTEMS.

The following is an analysis of the costs for several of the systems which are outlined in this report. Not all systems have been analyze, only those which were considered to be basically feasible have been covered.

Most of the prices given here are estimates, supplied by oomputer vendors here in Bangkok. More firm prices are being produced by the vendors, and will be provided at the end of January. It is expected that there will be only a few percent change in prices. There has been no allowance for inflation or for the present trend for computer prices to drop with time.

We have not included a salvage value for the proposed equipment. It has been our experience that the average life span for computer equipment is about 4-6 years, and at the end of this period, the equipment has only a scrap value (about 5% of the purchase price). Advances in computer technology presently result in radical changes in technology every 3-5 years, and this reduces salvage value. It should be noted that the life span of computer equipment is determined not by failure, but by the availability of more cost effective and efficient equipment.

In reviewing some of the price information which NEA has provided Theatho, it was noted that there were several price errors. These errors effected the results of those studies.

Where prices have been given in Baht, they have been converted to Dollars, at the exchange rate of 22.80 Baht to one U.S. Dollar.

LEASING VERSES PURCHASE

Leasing presents several problems both in practice and in cost analysis. NEA is able to take advantage of duty free privileges, however this privilege is very difficult to implement for leased equipment, as ownership of the leased computer equipment remains with the vendor. Vendors are generally unwilling to lease to duty free customers, as they usually are either unable to obtain the equipment at duty free prices, or if they are able to obtain it at duty free prices, must guarantee the lease for a period of five years, a period which exceeds normal lease times by several years.

Leasing for periods of over 3 years has not been shown to be cost effective when dealing with computer equipment. Most vendors calculate the break even point at about 30 months. This means that the hardware investment and costs will be recovered in that period. When a user has a long term requirement for a computer system which will not change appreciably in 4-6 years, then leasing will not be cost effective. The primary value in leasing is for short periods of time, to implement special projects, where there will be rapid and unplannable growth etc., which will result in a changing computer system requirement. We do not feel that the NEA and NEIC system will require the changes which make leasing advantageous.

We do not, at this time, recommend leasing for NEA and NEIC.

For the purposes of cost analysis we have chosen a period of five years. We feel that this period is a realistic planning horizon for this installation. Planning for the replacement of this system should begin about 30 months after the initial installation, and a firm replacement schedule should be finished about 48 months after the initial system installation. Reviews of the systems performance should be made on an annual basis, and as required by special circumstances.

HIDDEN COSTS.

There are a number of hidden costs in the installation of any computer system. Most of these costs are not for computer equipment, but for equipment and facilities used to support it. Some of the items which will have to be considered include:

-Air conditioning costs, which should be minimal, as the present computer room is already air conditioned.
-Electrical wiring, and power conditioning. Power regulation would cost about Baht 24,000 for the HP-3000.
-Equipment moving and shipping costs. The inital installation will be covered in the price quote from the vendor.
-Computer center preparations cost, again this should be minimal, as the present computer room is satisfactory.
-Computer forms and paper. Special forms may be required.
-Diskettes, tapes, and diskpacks.
-Additional staff.
The three above items will be continuing costs which are based on the actual usage of the computer facility.
-Miscellaneous equipment rental, including telephone lines. With the HP-3000 there should be no additional equipment required.

This list is an example, and there may be other expenses which were not listed, as they will be only known after the installation. It is estimated that the total cost of these items will be about Baht 50-70,000.

The cost to convert existing applications to the selected computer system should also be included in the budget if the selected system is not similar to the presently used system.

COST ANALYSIS OF HEWLETT PACKARD HP3000 MINICOMPUTER.

The costs of a Hewlett Packard (HP) minicomputer are evaluated below, subject to the following constraints:

-The system will be purchased tax-free.

-The purchaser will perform the following tasks, as required:

a) Opening of the letter of credit (if required).
b) Clearing of customs, and other formalities.

-The vendor is able to provide the above services, but feels that it is in the best interest of the purchaser for the purchaser to perform the tasks them self.

Basic one time investment:

Hardware	$113,000.
Software	7,545.
One time charges	0,000.
total	120,545.

Annual operating expenses:

Maintenance (est.)	$16,500.	
Consumable supplies	x,000.	(as required)
Personnel	x,000.	(as required)
total	16,500.	

The total cost for five years would be:

One time investment	120,545.
Five year operating	82,500.
total	203,045.

Please refer to the attached quote from Unimesa for prices. Delivery times are currently being investigated by HP in the USA. It is also recommended that if HP computer equipment is selected, that the purchase of the equipment be coordinated with Unimesa in order that they be able to provide the necessary maintenance and support services.

The configuration for the HP equipment has been expanded from that which has previously been quoted by Unimesa. This is necessary to provide the required communications facilities which NEA and NEIC will require to transfer information and programs with other computer systems. Some of the items added include:

-9 Track, 1600 BPI, tape unit.
-8 Inch IBM 3740 compatible diskette unit
-Additional support hardware and software.

COST ANALYSIS OF IBM LINK TO NSO SYSTEM.

The cost of a direct link with the NSO IBM System/370 computer are evaluated below. There are several constraints for this system also.

-The system will be purchased tax-free.

-The purchaser will perform the following tasks, as required:

a) Opening of the letter of credit (if required).
b) Clearing of customs, and other formalities.

-The vendor is able to provide the above services, but feels that it is in the best interest of the purchaser for the purchaser to perform the tasks them self.

Basic one time investment:

Hardware	$68,500.*
Software	5,000.
One time charges	7,000.
total	80,500.

Annual operating expenses:

Maintenance (est.)	$10,000.	
Consumable supplies	x,000.	(as required)
Personnel	x,000.	(as required)
total	10,000.	

The total cost for five years would be:

One time investment	80,500.
Five year operating	50,000.
total	130,500.

*please see below, "IBM EQUIPMENT LIST".

COST ANALYSIS OF IBM LINK TO AIT SYSTEM.

The cost of a direct link with the AIT IBM System/370 computer are evaluated below. There are several constraints for this system also.

-The equipment will be purchased tax-free.

-The purchaser will perform the following tasks, as required:

a) Opening of the letter of credit (if required).
b) Clearing of customs, and other formalities.

-The vendor is able to provide the above services, but feels that it is in the best interest of the purchaser for the purchaser to perform the tasks them self.

-That the user (NSO) would arrange the communications with AIT.

Basic one time investment:

Hardware	$68,500.*
Software	5,000.
Communications	100,000.
One time charges	7,000.
total	180,500.

Annual operating expenses:

Maintenance (est.)	$10,000.	
Consumable supplies	x,000.	(as required)
Communications cost	10,000.	
Personnel	x,000.	(as required)
total	20,000.	

The total cost for five years would be:

One time investment	180,500.
Five year operating	100,000.
total	280,500.

*please see below, "IBM EQUIPMENT LIST"

FINAL COMPARISON OF THE ALTERNATIVES.

For visibility, we shall now compare the cost of each of the above alternatives side by side. The five year costs are based on a straight line estimation of the costs for five years, no attempt has been made to account for inflation, present value of money etc.

System:	HP3000	NSO SYSTEM	AIT SYSTEM
Item:			
One time cost	120,545	80,500	180,500
Operating	82,500	50,000	100,000
total cost (for five years)	203,045	130,500	280,500

As seen from the above list of costs, there is a large variation in the final five year cost of operating each of these systems. The cost difference in the variable costs is not that great, however the initial cost of the installation is a major factor.

The final recommendation is based on two factors:

<u>Performance</u>, and
<u>Cost</u>

Above, we examined each factor and the individual factors which influence them. Each of the two factors tend to lead to selection of a different system. The factor of performance dictates that the Hewlett Packard system be selected as this system is the only one which will be able to meet the requirements of the NEIC. The factor of cost, however favours the link to the NSO computer system, as the total cost is only about seventy percent of the HP system.

In a final evaluation, however we are able to make the following recommendations:

1) That the Hewlett Packard HP3000 minicomputer system, using the MINISIS software is the most desirable system for NEA at this time. It meets a majority of the specified requirements (see above, Hardware Alternatives Available to NEA).

2) That the link to the NSO IBM System/370 computer is the second most desirable solution, but it does not meet all of the NEIC requirements.

3) That the link to the AIT IBM System/370 computer is not feasible either in performance, or cost. This alternative will not be feasible until there is a major improvement in the communications with AIT.

IBM EQUIPMENT LIST.

The following list of equipment is for a link to either NSO, or AIT. The microwave communications equipment will only be required if the link is to AIT (see below). There are several methods for linking to IBM computers, we will examine two separate systems, the first an IBM minicomputer doing both the linking and in house processing, and a second, less flexible system using only terminals. First the costs of the IBM minicomputer system:

IBM Alternative 'A', minicomputer:

CPU unit (534X) (SYSTEM/34)	55,000
Terminals (3 each)	13,500
total cost for general hardware	68,000

IBM Alternative 'B', terminals:

The second method, using only terminals to work with a mainframe IBM computer is priced below. This system is a basic remote terminal cluster, which allows for the attachment of up to 32 terminals. These terminals are standard IBM 3270 type, and there are compatible printers and other accessories available.

Terminal control unit 3280	$18,000
Terminal 3270 (3 each)	13,500
Printer	8,000
Modem (two sets)	11,000
Line set	3,500
total cost for general hardware	54,000

Costs of the communications link to AIT are difficult to establish without a further study for the installation of microwave equipment. It can be estimated however that the the system would be a single shot system, requiring however advanced equipment. The estimated cost of the system would be about $100,000 for a proper study of the requirements for communications, conditions etc., the purchase and installation of the equipment, and the placing into operation of the system. It should be noted that such a system would require maintenance to maintain its performance, and that the estimated cost of the maintenance would be about $10,000. The installation of a microwave link of such a distance is not a simple matter, and we do not recommend such a system be implemented.

When using the prices above we have selected the first alternative, the SYSTEM/34 minicomputer, as it offers the most flexibility to the NEA. This system will be able to perform as a stand-alone computer system, whereas the terminal option will only be able to function with the host computer (NSO or AIT) operating and online

These prices are not firm quotes, but are estimates based on information received from IBM. A firm price quote can be requested from IBM. Delivery times from IBM range to about

180-275 days, though these times are not firm.

INVESTMENT SUMMARY (NEIC)

			FOB US$
I	HARDWARE CONFIGURATION		116,457.-
II	LANGUAGE SOFTWARE + ACCESSORIES		6,685.-
	TOTAL FOB		US$ 123,142.-
III	TRAINING PER PERSON		
	IN THAILAND	29,400.-	BAHT
	IN SINGAPORE	2,156.-	S$
IV	STANDARD MONTHLY MAINTENANCE CHARGES (SMMC)		
	TOTAL SMMC	31,423	BAHT/ MONTH
V	CUSTOMER SUPPORT SERVICES (CSS)		
	TOTAL CSS	1,462.-	BAHT/ MONTH

Unimesa Co., Ltd.
30 PATPONG AVENUE • BANGKOK • THAILAND
TELEPHONE: 2340991-3 • CABLE • SIMONCO BANGKOK

RFQ Number: 83 - 003

Customer Name:	Peter D. Hipson (NEIC)	SR: PREECHA JIRA	DATE: 10 Jan 1983
Address:	REF: NEA Information Center Pibultham Villa, Kasatsuk Bridge, Bangkok	CE: Rux Jira SE:	

Item	Description	Unit Price (FOB) US$	Qty.	Amount (FOB) US$	SMMC BAHT
	HARDWARE CONFIGURATION				
1	32445A HP 3000/40 SPU	48,625.-	1	48,625.-	15,650.-
	- 512 K bytes fault control memory expandable to 2 Megabytes				
	- 2 General I/O channels				
	- Remote diagnostic capability				
	- Fundamental Operating Software (MPE) distributed on 1600 bpi Mag. tape				
	- Complete Manual set				
	Opt. 015 220 Vac, 50 Hz	-		-	-
2	30079A General I/O channel	2,365.-	1	2,365.-	815.-
	Opt. 040 for series 40	-		-	-
3	30018A Asynchronous data communication controller (Main)	2,100.-	2	4,200.-	1,260.-
	Opt. 040 for series 40	-		-	-
4	7912P System disc 64 M bytes, with integrated cartridge tape drive	21,250.-	1	21,250.-	5,010.-
	Opt. 001 Dedicated controller	2,250.-	1	2,250.-	-
	Opt. 015 220 Vac, 50 Hz	-		-	-
	Disc Storage Expandable to 2.89 Gigabytes				

REMARK: TOTAL

TTT

Unimesa Co., Ltd.
30 PATPONG AVENUE • BANGKOK • THAILAND
TELEPHONE: 2340991-3 · CABLE · SIMONCO BANGKOK

RFQ Number: 83 - 003

Customer Name: Peter D. Hipson (NEIC)

SR: PREECHA JIRA

DATE: 10 Jan 1983

Address: REF: NEA Information Center
Pibultham Villa,
Kasatsuk Bridge,
Bangkok.

CE: Rux Jira

SE:

Item	Description	Unit Price (FOB) US$	Qty.	Amount (FOB) US$	SMMC BAHT
5	7970E 1600 bpi Mag. Tape	12,475.-	1	12,475.-	3,248.-
	Opt. 015 220 Vac, 50 Hz	-		-	-
	Opt. 426 HP-IB Subsystem	6,275.-	1	6,275.-	-
6	2631B Serial Printer	4,875.-	1	4,875.-	2,440.-
	- 7X9 Dot matrix impact				
	- 180 Character per second				
	- 128 US.ASCII Character set				
	- RS-232 Cable				
	Opt. 015 220 Vac, 50 Hz	-		-	-
	Opt. 068 3 Ribbon cartridges	75.-	1	75.-	-
	Opt. 331 Used with HP3000 cable included	-		-	-
	Opt. S15 Dual Thai/English Feature	195.-	1	195.-	-
7	26097A Pedestal for 2631B Printer	428.-	1	428.-	
	Includes casters				
8	2622A Display Station	2,720.-	4	10,880.-	3,000.-
	Opt. 015 220 Vac, 50 Hz	-		-	-
	Opt. 301 US. Modem cable	99.-	4	396.-	-
	Opt. 888 Thai & English feature (order)	542.-	4	2,168.-	-
	separately in Thailand				
9	30037A ASYNC. REPEATER	1,320.-	2	2,640.-	-
	TOTAL			116,457.-	31,423.-
				119,097	

REMARK:

Unimesa Co., Ltd.
30 PATPONG AVENUE • BANGKOK • THAILAND
TELEPHONE: 2340991-3 • CABLE • SIMONCO BANGKOK

RFQ Number: 83 - 003 (Revised)

Customer Name: Peter D. Hipson (NEIC)

SR: PREECHA JIRA

DATE: 10 Jan 1983

Address: REF: NEA Information Center
Pibultham Villa,
Kasatsuk Bridge,
Bangkok.

CE: Rux Jira

SE:

Item	Description	Unit Price (FOB) US$	Qty.	Amount (FOB) US$	SMMC
	Language Software				
1	32102B FORTRAN/3000 Compiler	2,565.-	1	2,565.-	
2	32100A SPL/3000 Compiler	3,410.-	1	3,410.-	
	Accessories Supply				
1	88140L Data Cartridge for 7912P (5/Pkg)	205.-	2	410.-	
2	92150F Mag. Tape 2400 ft. (10/Box)	300.-	1	300.-	
			TOTAL	6,685.-	

REMARK:

Standard Monthly Maintenance Charges (SMMC) for NEIC, 10 January 1983

ITEM	PRODUCT NO.	DESCRIPTION	QTY.	SMMC/UNIT/MONTH	SMMC/NET/MONTH
1	32445A	HP3000/40 SPU	1	15,650.-	15,650.-
2	30079A	General I/O Channel	1	815.-	815.-
3	30018A	ADCC Main	2	630.-	1,260.-
4	7912P	Disc Drive	1	5,010.-	5,010.-
5	7970E	Tape Drive	1	3,248.-	3,248.-
6	2631B	Serial Printer	1	2,440.-	2,440.-
7	26097A	Printer Stand	1	-	-
8	2622A	Display Station	4	750.-	3,000.-
			(Revised)	Total SMMC (BAHT/MONTH)	31,423.-

Customer Support Services (CSS) NEIC, 10 January 1983

ITEM	PRODUCT NO.	DESCRIPTION	QTY.	CSS (BAHT/MONTH)
1	32102B	FORTRAN/3000 Compiler	1	998.-
2	32100A	SPL/3000 Compiler	1	464.-
		(Revised) Total CSS (BAHT/MONTH)		1,462.-

PREFACE

The antecedents of this report extend back over a period of some twelve years to the work conducted at the International Labour Office (ILO, Geneva) to prepare an Integrated Set of Information Systems (ISIS). ISIS was conceived to perform a variety of functions relevant to the management of libraries, the creation of data bases, and the retrieval of information.

Since that time, both Unesco and the International Development Research Centre (IDRC) have been involved in the development of software belonging to the ISIS family of systems. Unesco has produced CDS/ISIS for use on IBM-compatible hardware, while IDRC has produced MINISIS for use on Hewlett-Packard minicomputers. Each organization operates its system for a number of in-house applications. Furthermore, because of its interest in fostering international cooperation in the information field and in providing tools for assisting national and international organizations, particularly those in developing countries, each has undertaken an on-going program of making its system available to a far-reaching international community. This involves continuous maintenance and improvement to the software, provision of training and installation services, and leadership of user groups.

Because of these common interests and goals, Unesco and IDRC are cooperating to ensure that both CDS/ISIS and MINISIS are available to institutions around the world and, when there is a question of choosing between these two systems, that an institution is able to make its selection on the basis of unbiased technical considerations.

Unesco and IDRC are also cooperating to ensure that the "compatibility" of the two systems is maintained and improved in successive versions. Of course, the basic aim is to facilitate the participation of countries and institutions in information networks and the exchange of data.

Although the basic computer logic used in MINISIS is quite different from that in CDS/ISIS, the two systems aim to perform essentially the same functions for the user. This study was undertaken to determine exactly what these functions are, and whether or not each system provides facilities for accomplishing them.

This report was prepared by Robert Valantin, an independent consultant resident in Toronto, Canada. Mr. Valantin has been given the opportunity to examine closely the most recent versions of CDS/ISIS and MINISIS and to enumerate, essentially from the point of view of the user, the functions of the two systems that coincide as well as to identify the differences.

It is hoped that the methodology developed for the purposes of this study will assist designers in determining the functional characteristics of systems in the planning stage, and set the ground for further compatibility studies between these and other existing systems.

CDS/ISIS and MINISIS:

A Functional Analysis and Comparison

Robert L. Valantin*

Prepared for the
International Development Research Centre
and the
United Nations Educational, Scien'ific and Cultural Organization

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an internationa Board of Governors. The Centre's headquarters are in Ottawa, Canada. Regional offices are located in Africa, Asia, Latin America, and the Middle East.

I. BACKGROUND: THE ISIS FAMILY OF SYSTEMS

This study analyzes two sets of software with common roots: CDS/ISIS, a version of ISIS developed by Unesco for use on large IBM and IBM-compatible mainframe computers under the OS operating system; and MINISIS, an application of relational techniques to the basic ISIS information storage and retrieval concepts, developed by IDRC for use on Hewlett-Packard minicomputers. Both systems rely on the basic structures and functional characteristics of ISIS, the software package originally developed by the International Labour Office (ILO) in Geneva as a generalized information storage and retrieval system with particular emphasis on bibliographic applications.

The original version of ISIS was written for use with IBM's DOS operating system, and was made available by the ILO to a variety of interested organizations within its member states. One of these organizations was the International Development Research Centre (IDRC), which adopted ISIS for bibliographic applications, primarily within its Information Sciences Division. In addition to adding a number of enhancements to DOS/ISIS, IDRC packaged a version for use within developing countries and in fact installed this version at a number of sites around the world. Recognizing that economies might be possible for dedicated installations in particular institutions, IDRC decided in 1975 to develop a similar system for use on H-P 3000 Series minicomputer hardware. The result, MINISIS, incorporated the basic functions of ISIS within a relational data base framework, with particular emphasis on easy user access to most facilities in an online environment.

Meanwhile, the original DOS version of ISIS was undergoing change at the ILO and being adapted to run under OS. The resulting version was eventually implemented by the ILO for its own work, and again made available to interested organizations. Unesco took an early version of the ILO's OS/ISIS originally prepared for the FAO and, in 1975, began a process of development and modification. Many of the existing functions were regrouped and reorganized, and the online processors were redesigned and rewritten to run under IBM's CICS. After a total investment of 8 man-years of work, the new rationalized system was named CDS/ISIS (for Unesco's Computerized Documentation System), and eventually became the "official" version of ISIS, with the ILO no longer distributing its version.

Currently there are a number of different systems in the ISIS family. They are all characterized by a number of common features, including: similar data base structure (MASTER and CROSSREFERENCE files with associated INVERTED, AUTHORITY, ANY files); similar basic record structure (leader, directory, variable length data); similar data structure (variable length fields and subfields); generalized data base definition; online data entry/modification and retrieval; and a variety of other basic functions (generation of sort key elements, print formatting, etc.). In particular, they all use the ISO standard 2709 format for data interchange, making it possible to exchange data bases amongst different installations.

At the present time, Unesco and IDRC are actively involved in the dissemination and continuing development of their respective systems. Both make their systems available to interested organizations around the world, and hold regular training courses, at home and abroad. Both have staff involved in the support of their software, continuously including improvements in a master version which is then distributed to all users. In addition, both have organized user groups, which meet regularly to exchange ideas and discuss further developments to their systems. Unesco has already made CDS/ISIS available to more than 50 national and international organizations, including other UN agencies such as FAO and UNIDO. IDRC has provided MINISIS to 70 institutions in developing countries.

In addition to these two fully-supported members of the ISIS family, there are a number of other versions in use. The original DOS version is still being made available by IDRC, although with very limited support, and is currently in use in a number of countries. It is still popular in Latin America; for example, an ISIS Resource Centre was recently established in Cartago, Costa Rica. The ILO/OS version is no longer being supported, most users having converted to CDS/ISIS; the ILO itself has adopted MINISIS for its own use. Finally, there are a number of offshoot systems currently being used, including a UNIVAC Cobol version in the Philippines and an IBM CMS version at ECLA in Chile.

2. THE STUDY

2.1 History of this Study

For some time, IDRC and Unesco have been keeping in close contact and discussing developments within the field of automated documentation systems. One question which has constantly arisen is that of compatibility among different information-handling software packages, and in particular between CDS/ISIS and MINISIS. During discussions in December 1979, it was decided that it would be useful to analyze the different functions carried out by each system and to compare the features available in each.

Such a study would be primarily directed at providing information to systems analysts working on each system so that features missing from one but present in the other could be considered for implementation in future releases. The rationale behind this was that since both systems aim at providing generalized database management services (with particular emphasis on bibliographic information systems) and since each belongs to the ISIS family, such information would enable CDS/ISIS and MINISIS to achieve functional compatibility in the long run. In addition, such a study would provide a useful checklist of features which could be applied to other software packages to determine their suitability for different applications.

2.2 Terms of Reference

The terms of reference selected for this study were:

(1) to identify the database management functions carried out by CDS/ISIS and by MINISIS. This identification should be carried out to a reasonable level of detail, with an emphasis on end-user functions. A base operational version of each system should be selected for the purposes of this identification, with features planned for implementation in the next year and being considered for future implementation included where possible but clearly indicated as such. No specific recommendations as to what "ought" to be implemented should be made;

(2) to identify where possible specific commands or sets of commands which involve a particular feature. This would be useful in preparing recommendations for common commands or command synonyms.

2.3 Method

In order to carry out this work, it was necessary to:

(1) select the most current operational versions of the systems:

CDS/ISIS - Release 3.2
MINISIS - Version D.00.00;

(2) define the term "function" as it would apply to this study: "a function is an operation which a user can perform or have performed on a database or the data contained therein";

(3) analyze the documentation describing the base versions and discuss certain points with IDRC and Unesco staff;

(4) draw up a chart identifying the main functions and subfunctions handled by the two systems, including as far as possible most of the features of both systems;

(5) indicate within the chart for each system in question:

   (a) whether the function could or could not be carried out,

   (b) which program or processor, or which command sequence or set of parameters would invoke the function in question,

   (c) an alternate approach for accomplishing this function where possible,

   (d) that the function was not applicable under the system in question, for overall design reasons,

   (e) that specific commands or parameters are functionally equivalent within the two systems.

2.4 Format

As this study is directed at systems analysts working on the two systems under consideration, it was decided to concentrate on specific features of both systems at a detailed technical level. It was assumed that these systems analysts have some knowledge of both systems and in particular of the basic aspects common to ISIS-like systems, as discussed in Section 1, and that they have access to the documentation describing both systems. It was therefore decided that the most efficient and clear means of reporting the results of the analysis and comparison was in the form of charts.

The overall classification scheme applied to the functions analyzed is given in the Table of Contents. Each function (or feature) has been divided into subfunctions where possible and these functions and subfunctions are detailed in the first column of the chart. One column is reserved for each of the two systems, and is used to describe if or how that function can be performed by the corresponding system. If the function refers to a major group of operations, the program or processor responsible for carrying out these operations is indicated. If the function is activated by a particular command or parameter, the command or parameter is given. If the command or parameter has a direct equivalent in both systems, this is indicated with an asterisk (*). In some cases, a simple yes or no is given to indicate that the function can or can not be performed; in others, a more detailed set of alternative means of accomplishing the same work is given.

2.5 The Issue of Compatibility

Although this study will not examine this question in detail, a few preliminary remarks are in order. Unfortunately, the concept of compatibility between "information systems" is often misunderstood, resulting in a good deal of confusion.

Systems can be compatible on a number of different levels. The lowest level is that of data interchange. Within this level, there are several cases to consider. The first is that of compatible physical structures or data "containers". Fortunately, there is already widespread agreement on this, with an international standard for bibliographic information interchange (ISO 2709) being recognized as the basic exchange format. The next case is that of compatible logical structures: which data elements are to be included in a bibliographic record, and in what form. There are a number of standards in this area, including those of UNISIST, MARC, AGRIS, and INIS. In many cases, it is not necessary to have fully compatible data elements, as long as their formats allow easy transformation by computer. Note that even users having the same hardware and software may have data which is not interchangeable because of essential incompatibilities in the structure of the data.

The next level, and the one of most importance to this study, is that of functional compatibility. Two systems are said to be "functionally compatible" when users can store and manipulate essentially the same kinds of data elements, and can perform, in one way or another, the same classes of operations on the data. Functional compatibility is involved in making choices of hardware and software for an information system; two functionally compatible systems will have to compete with each other on price, availability, performance and other such criteria.

Thirdly, there is end-user compatibility. With full compatibility at this level, a user need not know with which system he or she is interacting, as all of the commands and command sequences are identical. This can be implemented as a high level network command language; for example, Euronet's DIANE command language. Of course, there are varying degrees of transparency at this level, with different amounts of agreement on command names and protocols. End-user compatibility is really only an issue if a particular user will access several systems, as it prevents the need to learn several sets of commands and protocols.

Finally, there is full compatibility, which is a combination of the three levels described above. In practice, this is rarely achieved, and only by translating a system from one computer language and/or hardware configuration to another.

A term related to compatibility, but meaning something quite different, is portability. A system is portable if the same software can be used on different manufacturer's hardware. Clearly portable software is compatible, but the converse is not necessarily true.

2.6 Conclusions

The main conclusion of this study is that there is a very high degree of functional compatibility between CDS/ISIS and MINISIS. Furthermore, this degree of compatibility is increasing with successive releases of the two systems. The main differences are due to differences in the computer manufacturer's software and to different philosophical and theoretical approaches to the systems design. In the first case, IBM software makes it difficult to perform certain functions, such as file creation, in an online environment, resulting in a clearer separation of online and batch functions in CDS/ISIS. Use of VSAM in Release 4.0 of CDS/ISIS will improve this situation somewhat. H-P's MPE Operating System makes online and batch operations equivalent, and MINISIS takes advantage of this capability. In the second case, MINISIS is based on a clear conceptual framework, the relational data base approach, and exploits this in the overall integrated design of the system. CDS/ISIS is more firmly rooted in the older DOS and OS versions of ISIS and still contains a good deal of evidence of the diverse functions implemented in its predecessors. Again, a more integrated approach is being followed for successive releases.

Because of the different approaches, many of the protocols and "ways of doing things" are quite different in the two systems. For those functions with direct equivalents in the two systems, there is a moderate degree of compatibility in command names at the end-user level.

Finally, the study itself seems to provide both a useful methodology for approaching the question of functional compatibility, and a checklist for designers of information systems.

2.7 Recommendations

At the level of functional compatibility, it is recommended that Unesco and IDRC continue their dialogue to ensure that successive versions retain and increase the degree of compatibility achieved to date. When implementing new functions, it is recommended that systems analysts in each organization attempt to choose command names and implementations which are compatible with those which may already exist in the other system. It would be useful to continue the updating of this report to provide a concise means of reporting new functions and ensuring their compatibility.

At the level of end-user compatibility, it is recommended that synonyms be provided for the most commonly used commands, so that users can feel familiar with both systems.

REPORT SUMMARY

The computer specialists of Theatho Co. Ltd.- Messrs. Peter Hipson and Michael Sherwood, surveyed and studied the situation at NEIC regarding its computer requirements, and presented the report 'Evaluation of Computer Requirements of the National Energy Administration and the National Energy Information Center' on February 1983.

The report can be summarized as follows:

Taking into consideration:

1. The present and future functions of the NEIC, which are:
   - To serve as a comprehensive energy data center which will collect and provide technical and statistical data on energy resources, planning, production, demand and supply, locally, and whenever required, regionally and internationally.
   - To provide library services for all documents, available in all forms - serials, monographs, pamphlets, microfiches, magnetic tapes, etc. This also entails specifically having an interactive bibliographic record system, which will store citations and retrieve them as needed, by author, title and keyword, for rapid distribution.
   - To serve as a link between the users and energy data available outside NEA.
2. The coordination of all information processes of the NEA, in the preparation of the Energy Master Plan, the collection and dissemination of Thai energy statistics and Thai data on resources as well as bibliographic data.
3. The fact that the hardware and the software alternatives, to handle points 1 and 2, are inreality limited, to the following:
   - Software:

     a. ISIS (Integrated Set of Information Systems) which runs on the large IBM Series 370, main frame computers, and which is operational now at the National Statistical Office and at the Asian Institute of Technology.

     b. MINISIS which is modeled after ISIS, and runs only on the Hewlett Packard 3000/40 mini-computer, being actually developed by the International Research and Development Centre for this kind of equipment.
   - Hardware:

     a. Linkage with the National Statistical Office, for which some support equipment exists at NEA, but which has serious disadvantages such as limitations on time and the lack of professional staff to offer guidance on a regular basis.

b. Linkage with AIT's IBM System 370, was also ruled out, since there are no remote communications at the present time, nor are they foreseen in the near future.

c. Purchase of an independent 'stand-alone' system, which actually satisfies mostly the needs of the NEIC.

4. The fact that the IDRC does provide the training on the MINISIS software selected, free of charge for those who have opted for the system.

Hence the recommendation is given by the consultants to utilize the MINISIS software package on the Hewlett Packard 3000/40, is given.

Although both systems - MINISIS and ISIS - essentially aim to perform the same functions for the user, i.e.:

- Performance of a variety of functions relevant to the management of libraries.
- Creation of data bases.
- Retrieval of information.

The choice was for MINISIS, for the following reasons:

1. It is available in a ready-to-use format.
2. It has particular emphasis on being 'user-friendly'.
3. It is able to function without having a full-time systems analyst on the premises.
4. Users already exist in Bangkok and the region, and so the exchange of information will be possible.
5. Training will be provided on it by the IDRC.
6. Its compatibility with ISIS will make it possible to exchange information with AIT which already has a data base in renewable energy.

Two appendices are attached to the report, provided by UNIMESA Co., representatives for Hewlett Packard in Thailand. These are: <u>Hewlett Packard Site Requirements</u> and <u>Site Survey Report</u>.

BUDGET CONSIDERATIONS

Based on a previous assumption, that the NEIC will link with the National Statistical Office, the following details are apparent:

Approved for FY82 and transferred to FY83:	$ US
Special office equipment, computer terminal and related equipment & NSO link	90,000
Contingency for computer equipment	22,000
TOTAL	112,200

After receipt of the new recommendation, which involves the request to purchase the HP 3000/40, and after receipt of the site survey details, the following is apparent:

		$ US
Hardware configuration		116,457
Asynchronous repeaters	2	2,640
Language software and accessories		6,685
TOTAL		125,782
Site preparation:		
Two air-conditioners (approved in FY82)		3,000
Line conditioner		4,000
Dehumidifier		500
TOTAL		7,500
Staff training:		
In Thailand, at Unimesa, for 4 persons		5,600
In Singapore for 2 persons, not including travel, accom. & per diem		2,200
TOTAL		7,800
Therefore, the excess of the already approved is:		
In hardware		13,582
In site preparation		4,500
In staff training		7,800
TOTAL		25,882

Annex IV-A

Persons Interviewed

1. Mr. Tammachart Sirivadhanakul
   Deputy Secretary-General
   National Energy Administration

2. Mr. Kriengkorn Bejraputra
   Head of Energy Policy Sector
   Energy Policy and Planning Division
   National Energy Administration

3. Dr. Itthi Bijayendrayodhin
   Director of Energy Economics Division
   National Energy Administration

4. Mr. Robert Vernstrom
   META Systems (Until January 1983)

5. Dr. Mari LaoSunthara
   Programme Specialist/Documentation
   Unesco Library, Bangkok

6. Ms. Knid Tantavirat
   Director
   Academic Resource Center
   Chulalongkorn University, Bangkok

7. Dr. Jacques Valls
   Director
   Library and Regional Documentation Center
   Asian Institute of Technology, Bangkok

8. Mr. Michael Sherwood
   MINISIS Project Advisor
   International Development Research Center
   c/o SEARCH
   P.O. Box 720 MCC, Makati, Metro Manila
   Philippines

9. Ms. On-Anong Suraniranat
   Senior Information Scientist
   Renewable Energy Resources Information
   Center
   Asian Institute of Technology, Bangkok

10. Mr. Ingolf Walter
    Systems Analyst/EBIS
    ESCAP Library
    ESCAP, Bangkok

11. Mr. Gary Spiller
    FAO Expert
    National Inland Fisheries Institute
    Bangkok

12. Ms. Rusmeearporn Pipitsombut
    Programmer for MINISIS
    National Inland Fisheries Institute
    Bangkok

13. Ms. Mary Jane Ruhl
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    USA

14. Ms. Janet Kubalak
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    Capital Systems Corp. Inc.
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    Chevy Chase, Md. 21895
    USA

15. Mr. B. Mathur
    Deputy Director, Information Resources
    Volunteers in Technical Assistance
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Annex IV-B

Persons & Agencies

Contacted by Correspondence

1. American Association of Engineering Societies
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2. American Council on Education
1 Dupont Circle
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USA

3. American Library Association
50 East Huron St.
Chicago, Ill. 60611
USA

4. Asian Development Bank
2330 Roxas Blvd.
Metro Manila
Philippines

5. Asian Network for Industrial Technology Information and Extension - Technonet Asia
Tanglin, P.O. Box 160
Singapore 9124

6. Australia Department of Resources and Energy
G.P.O. Box 858
Canberra, A.C.T. 2601
Australia

7. Battelle Energy Information Center
Battelle - Geneva Research Centers
7 Route de Drize
1227 Carouge - Geneva
Switzerland

8. BHRA Fluid Engineering
Cranfield, Bedford MK43 OAJ
England

9. Biomass Conversion Technical Information Service
Institute for Industrial Research and Standards
Ballymun Rd., Dublin 9
Ireland

10. Bituminous Coal Research Inc.
350 Hochberg Rd.
P.O. Box 278
Monroeville, Pa. 15146
USA

11. Board on Science and Technology for International Development (BOSTID)
2101 Constitution Ave. N.W.
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12. Brace Research Institute
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13. British Hydromechanics Research Association
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14. The British Institute of Energy Economics
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London, SW1Y 4LE
England

15. The British Library
Lending Division
Boston Spa
Wetherby, West Yorkshire LS23 7BQ
England

16. The Brookings Institution
17'5 Mass Ave. N.W.
Washington, D.C. 20036
USA

17. Bureau of Energy Utilization
Ministry of Energy Bldg.
Merritt Rd. Fort Bonifacio
Makati, Metro Manila
Philippines

18. Bureau of Mineral Resources, Geology and Geophysics
Department of Resources and Energy
P.O. Box 378
Canberra City, A.C.T. 2601
Australia

19. Carbon Dioxide Information Center (CDIC)
Oak Ridge National Laboratory
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Oak Ridge, Tenn. 37830
USA

20. Center for Alternative Technology
Llwyngwern Quarry
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21. Central Bureau of Statistics
8 Jalan Dokter Sutomo
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22. Central Fuel Research Institute
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23. Central Mechanical Engineering Research Institute
Information and Publication
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24. Central Power Research Institute
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Bangalore 560 012
India

25. Ceylon Institute of Scientific and Industrial Research
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363, Bauddaloka Mawatha
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26. Chase Manhattan Bank
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27. Clean Energy Research Institute
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28. Coal Extraction and Utilization Research Center
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USA

29. Coal File
Ministry of Energy, Mines and Petroleum Resources
Victoria, British Columbia
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30. Coal Research Bureau
West Virginia University
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31. Coal Research Institute of Daittan
Coal Corporation
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Mapo-Ku, Seoul
Korea

32. Coal Technology Information Center
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33. The Combustion Institute
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USA

34. Commission of European Communities
DG XIII/A
P.O. Box 1907
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B-4/068, Luxembourg

35. Commission of International Relations
(JH 214)
National Academy of Science
National Research Council
2101 Constitution Ave.
Washington, D.C. 20418
USA

36. Committee on Data for Science & Technology (CODATA)
51 Boulevard de Montmorency
75016 Paris, France

37. Commonwealth Scientific and Industrial Research Organization (CSIRO)
Central Information, Library and Editorial Section
314 Albert St.
East Melbourne, Victoria
Australia 3002

38. Congressional Research Service
Library of Congress
Washington, D.C. 20540
USA

39. Denmark Technical University
Physics Laboratory III
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40. Develop Information Service
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41. DRI Europe, Inc.
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42. DRI Europe, Inc.
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43. Earthscan
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44. East-West Center
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45. EIC/Intelligence
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46. Electric Power Research Institute (EPRI)
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Palo Alto, Calif 94303
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47. Electricity Supply Board
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48. Energy Technology Support Unit
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49. Engineering Experiment Station
University of North Dakota
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50. Engineers Joint Council
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51. Environmental Assessment Section
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52. Erasmus University
Rotterdam Center for International Energy Studies
Erasmus University
Rotterdam, Netherlands

53. ESCAP/Regional Centre for Technology Transfer (RCTT)
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54. ESCAP/Regional Mineral Resources Development Center (RMRDC)
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Bandung, Indonesia

55. Exxon Corporation
Public Affairs Dept. Rm. 4628A
1251 Ave of the Americas
New York, N.Y. 10020
USA

56. Federation of Engineering Institutions of Southeast Asia and the Pacific (FEISEAP)
Energy Resources Development Center
Don Mariano Marcus Ave.
Quezon City, Metro Manila
Philippines

57. Friends of the Earth
1045 Sansome St.
San Francisco, Calif. 94111
USA

58. Gastech Ltd.
2 Station Rd.
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59. Geothermal Resources Council
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Davis, Calif. 95617

60. German Appropriate Technology Exchange (GATE)
Postfach 5180
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61. Industrial and Trade Fairs Ltd.
Radcliffe House, Blenheim Court
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62. Institute for Energy Studies/Energy Modelling Forum
Terman Engineering Center
Stanford University
Stanford, Calif. 94305
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63. Institute for Industrial Research and Standards
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64. Institute for Mining and Minerals Research
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67. Institute of Gas Technology
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69. Institute of Statisticians
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70. Institute of Technology Bandung
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72. International Atomic Energy Agency
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73. International Center for Theoretical Physics
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P.O. Box 586
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74. International Development Research Center
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Singapore 9124

75. International Electrotechnical Commission
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Geneva, Switzerland

76. International Energy Agency
Coal Research - Technical Information Service
14/15 Lower Grosvenor Place
London SW1W OEX
England

77. International Institute for Applied Systems Analysis (IIASA)
A-2361, Laxenburg
Austria

78. International Solar Energy Society
P.O. Box 52
Parkville 3052, Victoria
Australia

79. ISO Secretariat
Case Postale 56
1211 Geneve 20
Switzerland

80. Japan Trade Center, Bangkok
Jetro Bldg.
159 Rajadamri Rd.
Bangkok 10500, Thailand

81. Kentucky Department of Energy
P.O. Box 11888
Ironworks Pike
Lexington, Ky. 40578
USA

82. Korea Institute for Industrial Economics and Technology
P.O. Box 205, Cheongryangri
Seoul, Korea

83. Library of Congress
Gifts and Exchange
Washington, D.C. 20540
USA

84. Liquid Fuels Trust Board
P.O. Box 17
7th floor, Creenock House
Lambton Quay, Wellington
New Zealand

85. Lloyd's Register of Shipping
71 Fenchurch St.
London EC3M 4BS
England

86. Malaysia. Ministry of Energy, Telecommunications and Posts
Kuala Lumpur
Malaysia

87. Massachusette's Institute of Technology
Energy Laboratory
Rm. E40-495
Cambridge, Mass. 02139
USA

88. Mineral Resources Institute and State Mine Experiment Station
University of Alabama
University, Ala. 35486
USA

89. Motor - Columbus Consulting Engineers, Inc.
Parkstrasse 27
CH-5400, Baden
Switzerland

90 Nagoya University
Dept. of Chemical Engineering
Nagoya
Japan

91 National Audobon Society
Environmental Policy Research Division
950 Third Ave.
New York, N.Y. 10022
USA

92. National Coal Association
1130, 17th St. N.W.
Washington, D.C. 20036
USA

93. National Library of Australia
Canberra, A.C.T. 2600
Australia

94. Natural Resources and Energy Division
Dept. of Technical Cooperation and Development
United Nations
New York, N.Y. 10017
USA

95. New Zealand Energy Research and Development Committee
University of Auckland
Private Bag
Auckland, New Zealand

96. New Zealand Ministry of Energy
Private Bag, Wellington
New Zealand

97. New Zealand National Organizing Committee
Alcohol Fuel Technology Sumposia
P.O. Box 5098
Wellington, New Zealand

98. Office of Appropriate Technology
1600 Ninth St.
Sacramento, Calif. 95814
USA

99. The Open University
Energy Research Group
Walton Hall
Milton Keynes MK7 6AA
England

100. Organization for Economic Cooperation and Development (OECD)
2 rue André-Pascal
75775 Paris, Cedex 16
France

101. Organization of the Petroleum Exporting Countries (OPEC)
Obere Danaustrasse 93
1020 Vienna II, Austria

102. Overseas Electrical Industry Survey Institute, Inc.
No. 4-2 Uchisaiwai-Cho
1-Chome, Chiyoda-Ku
Tokyo 100, Japan

103. Pakistan Council of Scientific and Industrial Research (PCSIR)
39 Garden Rd.
Karachi-0310, Pakistan

104. Philippines National Science Development Board
Scientific Library and Documentation Division
Bicutan, Taquig
Metro Manila
Philippines

105. The Philippines Women's University
Taft Avenue
Metro Manila
Philippines

106. PNOC - Energy Research & Development Center
Don Mariano Marcos Ave.
Diliman, Quezon City
Philippines

107. The Polytechnic of Central London
35 Marylebone Rd.
London NW1 5LS
England

108. Power Research Institute
Scientific Services Division
P.O. Box I/KBT Kebayoran
Jakarta, Indonesia

109. Renewable Energy Institute
Engineering Experiment Station
Box 8103, University Station
Grand Forks, N.D. 58202
USA

110. Renewable Energy Resources Information Center
Asian Institute of Technology
P.O. Box 2754
Bangkok, Thailand

111. Resources for the Future
1755 Mass. Ave. N.W.
Washington, D.C. 20036
USA

112. Singapore Science Center
Science Center Rd.
Singapore 2260

113. Societe Nationale Elf-Aquitaine (SNEA)
7 rue Nelaton
75015, Paris, France

114. The Society of Tropical Resources Technologists
c/o Lab. of Agric. Process Eng.
College of Agric., University of Ryukyus
Nishihara, Okinawa
Japan 903-01

115. Stanford University
Dept. of Operations Research
Stanford, Calif. 94305
USA

116. Stanford University
Energy Information Center
Bldg. 500, Room 500A
Stanford, Calif 94305
USA

117. Statistical Office of the European Communities
1049 Bruxelles
Bat. Berlaymont
Rue de la Loi 200
Belgium

118. Superintendent of Documents
Government Printing Office
Washington, D.C. 20402
USA

119. TATA Energy Research Institute
Bombay House
24 Homi Mody St.
Bombay 400 023
India

120. Turbomachinery Laboratories
Department of Mechanical Engineering
Texas A & M University
College Station, Tex. 77843
USA

121. UNESCO
Division of Scientific and Technical Documentation and Information
7 Place de Fontenoy
Paris 75700, France

122. UNESCO
Division of the UNESCO Library/Archives and Documentation Services
7 Place de Fontenoy
75700 Paris, France

123. UNESCO
Energy Information Section
7 Place de Fontenoy
75700 Paris, France

124. UNESCO International Network of Information Systems Relating to New and Renewable Energy Sources
Division of Technical Research and Higher Education
7 Place de Fontenoy
75700 Paris, France

125. UNESCO Regional Office for Science and Technology for Southeast Asia (ROSTSEA)
Jl. Thamrin 74
Tromolpos 273/JKT
Jakarta, Indonesia

126. U.K. Department of Energy
Library, Room 1020
Thames House South
Millbank, London SW1P 4QJ
England

127. U.K. Department of Energy
Offshore Supplies Office
Alhambra House
45 Waterloo St.
Glasgow G2 6AS
Scotland

128. UK - ISES
19 Albemarle St.
London W1X 3HA
England

129. UN/Asian and Pacific Development Center (APDC)
Ms. Agnes How, Librarian
P.O. Box 2224
Kuala Lumpur, Malaysia

130. United Nations Conference on New and Renewable Sources of Energy
Secretariat
Room 1061-J
United Nations
New York, N.Y. 10017
USA

131. United Nations University
Toho Seimi Bldg.
15-1 Shibuya-ku, 2 chome
Tokyo 150, Japan

132. U.S. Department of Commerce
National Technical Information Services (NTIS)
5285 Port Royal Rd.
Springfield, Va. 22161
USA

133. U.S. Department of Energy
National Energy Information Center
EI-20
Forrestal Bldg.
Washington, D.C. 20585
USA

134. U.S. Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, Tenn. 37830
USA

135. The University of Queensland Press
P.O. Box 42
St. Lucia Q 4067
Australia

136. University of the Ryukyus
903 Shuri - Tonckura - cho, 3 - 1
Naha - shi, Japan

137. University of Utah
Utah Engineering Experiment Station
Salt Lake City
Utah 84112
USA

138. University Pertanian Malaysia
Dept. of Power & Machinery Engineering
Serdang, Selangor
Malaysia

139. The University Press of Florida
15 N.W. 15th St.
Gainsville, Fla. 32603
USA

140. The University Press of Kentucky
Lexington, Ky. 40506
USA

141. World Bank Publications
1818 H. Street, N.W.
Washington, D.C. 20433
USA

142. World Energy Industry-Information Services
4202 Sorrento Valley Blvd.
San Diego, Calif 92121
USA

Annex IV-C

CENTERS AND AGENCIES VISITED

1. Chulalongkorn University
   Faculty of Engineering
   Institute of Research and Development for the Faculty of Engineering

2. Chulalongkorn University
   Faculty of Engineering
   Library

3. Chulalongkorn University
   Faculty of Science
   Department of Chemical Technology
   Library

4. Chulalongkorn University
   Faculty of Science
   Library

5. Department of Mineral Resources
   Library

6. Department of Mineral Resources
   Natural Fuels Division

7. Electricity Generating Authority of Thailand
   Energy Technology Division

8. Electricity Generating Authority of Thailand
   Library

9. ESSO Standard Thailand Ltd.

10. King Mongkut's Institute of Technology, Thonburi Campus
    Central Library

11. King Mongkut's Institute of Technology, Thonburi Campus
    Faculty of Energy and Materials

12. Mobil Oil of Thailand

13. National Research Council
    Library

14. Petroleum Authority of Thailand
    Data and Information Center

15. Shell Company of Thailand Ltd.

16. Thai National Documentation Center

Visits, in addition, were made to the Embassies of:

1. Australia
2. Indonesia
3. Malaysia
4. Singapore

These visits were made to request the addresses of the relevant organizations related to the energy field in the respective countries.

Annex IV-D

TOOLS UTILIZED IN SELECTION OF ENERGY MATERIALS

I. Selection Tools for New Titles

A. Books as selection tools:

1 *Books in Print.* 4 vols. New York: R.R. Bowker (Annual)

2. *Scientific and Technical Books and Serials in Print.* New York: R.R. Bowker (Annual)

3. Viola, John, Mack, Newell B., and Stauffer, Thomas R. *Energy Research Guide: Journals, Indexes, and Abstracts.* Cambridge, Mass.: Ballinger, 1983.

B. Serials as selection tools:

1. *Energy Abstracts for Policy Analysis.* U.S. Department of Energy Technical Information Center.

2. *Energy Economics.* Butterworth Scientific Ltd.

3. *Energy Policy.* Butterworth Scientific Ltd.

4. *Energy Information Abstracts.* EIC/Intelligence

5. *Opec Bulletin.* Organization of the Petroleum Exporting Countries.

6. *Petroleum Economist.* Petroleum Economist

7. *Solar Energy.* Pergamon Press.

8. *Solar Energy Intelligence Report.* Business Publishers, Inc.

II. Selection Tools for New Titles of Serials

1. *Faxon: Librarian's Guide to Serials.* Westwood, Mass.: F.W. Faxon (Annual)

2. Miller, Richard K. *Directory of Technical Magazines and Directories.* Atlanta, Ga.: Fairmont Press, 1981.

3. *Ulrich's International Periodicals Directory.* 21st ed. 2 vols. New York: R.R. Bowker (Annual)

Annex IV-E

Cataloguing and Calssification tools

1. สุทธิลักษณ์ อำพันวงศ์. หลักเกณฑ์การทำบัตรรายการหนังสือภาษาไทยฉบับสมบูรณ์และตัวอย่างบัตร (*Rules for Cataloguing Thai Books: Complete Edition and Samples*) กรุงเทพ ฯ: จุฬาลงกรณมหาวิทยาลัย 2510

2. ห้องสมุดแห่งประเทศไทย, สมาคม. หัวเรื่องสำหรับหนังสือภาษาไทย (*Subject Headings for Thai Books*) พิมพ์ครั้งที่ 4. กรุงเทพ ฯ 2525.

3. Dewey, Melvil. *Dewey Decimal Classification and Relative Index.* 19th ed. 3 vols. Albany, N.Y.: Forest Press, 1979.

4. Garman, Michael, and Winkler, Paul W., end. *Anglo-American Cataloguing Rules.* 2nd ed. Chicago: American Library Association, 1978.

5. United States. Library of Congress. Subject Cataloguing Division. "LC Subdivisions." 8th ed. Washington, D.C. 1978 (Mimeo) *Library of Congress Subject Headings.* 9th ed. 2 vols. Washington, D.C. 1980.

Annex IV-F

Publishers and Book Dealers of Energy Information

1. Academic Press
111 Fifth Ave.
New York, N.Y. 10003
USA

2. Acta Press
P.O. Box 3243 Post Stn. B.
Calgary, Alberta
Canada, T2M 4L8

3. Adult Literacy and Basic Skills Unit
Kingsbourne House
229-231 High Holborn
London WC1V 7DA
England

4. AEE Energy Bks.
Dept. 1095
Association of Energy Engineers
4025 Pleasantville Rd., Suite 340
Atlanta, Ga. 30340
USA

5. Agency for International Development
DIHF/ARDA
7222 47th St., Suite 100
Chevy Chase, Ma. 20815
USA

6. AIM
Rue Saint - Gilles 31
B-4000 Liege
Belgium

7. Alaska Center for the Environment
1069 West 6th Ave.
Anchorage, Ak. 99501
USA

8. Alberta Research Council
5th Floor, Terrace Plaza
4445 Calgary Trail South
Edmonton, Alberta
Canada, T6H 5R7

9. Alcohol Week
P.O. Box 7167
Benjamin Franklin Station
Washington, D.C. 20044
USA

10. Ambient Press Ltd.
Hornby, Lancaster LA2 8LB
England

11. American Association of Engineering Societies
Dept. PC # 4
345 East 47th St.
New York, N.Y. 10017
USA

12. American Chamber of Commerce
1030 Swire House
Hong Kong

13. American Chemical Society
1155 Sixteenth St., N.W.
Washington, D.C. 20036
USA

14. American Gas Association
1515 Wilson Blvd.
Arlington, Va. 22209
USA

15. American Library Association
50 East Huron St.
Chicago, Ill. 60611
USA

16. American Nuclear Society
555 North Kensington Ave.
La Grange Park, Ill. 60525
USA

17. American Overseas Book Co., Inc.
53 Orchard St.
Ridgefield Park, NJ. 07660
USA

18. American Society of Civil Engineers
0-87262 345 E.
47th St., N.Y. 10017
USA

19. The American Society of Mechanical Engineers
P.O. Box 3199, Grand Central Station
New York, N.Y. 10163
USA

20. American Solar Energy Society, Inc.
1230 Grandview Ave.
Boulder, Colo. 80302
USA

21. Annual Reviews Inc.
4139 El Camino Way
Palo Alto, Calif. 94306
USA

22. Applied Energy Services Inc.
1925 N. Lynn St., Suite 1200
Arlington, Va. 22209
USA

23. Asian Development Bank
2330 Roxas Blvd.
Metro Manila, Philippines

24. Asian Electricity
Times House
Throwley Way, Sutton
Surrey, SM1 4AF
England

25. Asian Recycling Association
P.O. Box 753
Bacolod City
Negros Occidental
Philippines

26. Associated Book Publishers Ltd.
North Way, Andover, Hampshire
England, SP10 5BE

27. Australian Government Publishing Service
G.P.O. Box 84
Canberra, A.C.T. 2601
Australia

28. Australian Institute of Energy
P.O. Box 230
Wahroonga, NSW 2076
Australia

29. Australian Institute of Petroleum Ltd.
227 Colins St.
Melbourne, Victoria 3000
Australia

30. Bangkok Book Center Co., Ltd.
292/15-16 Lookluang Rd.
Bangkok 10300, Thailand

31. Battelle Columbus Laboratories
Publications Office
505 King Ave.
Columbus, Ohio 43201
USA

32. Benn Publications Ltd.
Sovereign Way
Tonbridge, Kent TN9 1RW
England

33. BHRA Fluid Engineering
Cranfield, Bedford
England, MK43 0AJ

34. Bio-Energy Council
1625 Eye St., N.W.
Suite 825 A
Washington, D.C. 20006
USA

35. Bituminous Coal Research, Inc.
350 Hochberg Rd.
P.O. Box 278
Monroeville, Pa. 15146
USA

36. Board on Science and Technology for
International Development (BOSTID)
National Research Council - National
Academy of Sciences
2101 Constitution Ave., N.W.
Washington, D.C. 20418
USA

37. Books & Journals Private Ltd.
6/2 Madam St.
Calcutta - 700 072
India

38. The Brookings Institution
1775 Mass. Ave. N.W.
Washington, D.C. 20036
USA

39. Business Press International Ltd.
Quadrant House
The Quadrant
Sutton, Surrey SM2 5AS
England

40. Business Publishers, Inc.
951 Pershing Drive
Silver Springs, Md. 20910
USA

41. Butane-Propane News
338 E. Foothill Blvd.
P.O. Box 419
Arcadia, Calif. 91006
USA

42. Butterworth Scientific Ltd.
P.O. Box 63, Westbury House
Bury St., Guildford
Surry GU2 5BH
England

43. The Canadian Hunger Foundation
323 Chapel St.
Ottawa, Canada K1N 7Z2

44. Central Department Store Co., Ltd.
306 Silom Rd.
Bangkok 10500, Thailand

45. Central Fuel Research Institute
P.O. F.R.I. - 828108
Dhanbad, Bihar
India

46. Central Power Research Institute
Publications
P.O. Box 1242
Bangalore - 560 012
India

47. Center for Alternative Technology
Llwyngwern Quarry
Machynlleth, Powys
Wales, Machynlleth 2400
UK

48. The Chemical Daily, Ltd.
International Division
Yashizawa Bldg.
31-7, Shinbashi 4-Chome
Minato-ku, Tokyo 105
Japan

49. Coal Research Bureau
West Virginia University
219 White Hall
Morgantown, W. Va. 26506
USA

50. CODATA Secretariat
51 Boulevard de Montmorency
75016 Paris
France

51. The Combustion Institute
200 South Craig St.
Pittsburgh, Pa. 15213
USA

52. Clean Energy Research Institute
University of Miami
P.O. Box 248294
Coral Gables, Fla. 33124
USA

53. Construction Press
Longman House
Burnt Mill, Harlow, Essex
England

54. Crane, Russak & Co., Inc.
3 East 44th St.
New York, N.Y. 10017
USA

55. Commonwealth Scientific and Industrial Research (CSIRO)
Editorial and Publications Service
314 Albert St.
East Melbourne, Victoria 3002
Australia

56. D. Reidel Publishing Co. (Kluwer Boston Inc.)
190 Old Derby St.
Hingham, Mass. 02043
USA

57. Duangkamol Co., Ltd. (D.K.)
244-246 Siam Square
Rama 1 Rd., Pratumwan
Bangkok 10500, Thailand

58. EG & G, Inc.
Corporate Communication and Information Department
45 William St.
Wellesley, Mass. 02181
USA

59. Earthscan
10 Percy St.
London W1P 0DR
England

60. East-West Center
1777 East-West Rd.
Honolulu, Hawaii 96848
USA

61. Eastern Research Analysis Corporation
P.O. Box 110
Farmington, Conn. 06032
USA

62. E & FN Spon Ltd.
Freepost, North Way
Andover, Hampshire SP10 5BR
England

63 EIC/Intelligence
48 West 38th St.
New York, N.Y. 10018
USA

64. Electric Power Research Institute
Research Reports Center
P.O. Box 50490
Palo Alto, Calif. 94303
USA

65. Elsevier Science Publishing Co., Inc.
52 Vanderbilt Ave.
New York, N.Y. 10017
USA

66. The English Book Depot
15 Rajpur Rd.
Dehra Dun-248001
India

67. Energy Information Administration
National Energy Information Center
Dept. of Energy
1000 Independent Ave., S.W.
Washington, D.C. 20585
USA

68. Energy Economics Research Ltd.
7/9 Queen Victoria St.
Reading, Berkshire RG1 1SY
England

69. Environment Action, Inc.
Room 731
1346 Connecticut Ave., N.W.
Washington, D.C. 20036
USA

70. ESCAP
The United Nations Building
Rajdamnern Ave.
Bangkok, Thailand

71. Environment Information Center, Inc.
292 Madison Ave.
New York, N.Y. 10017
USA

72. Europa Publications Ltd.
18 Bedford Square
London WC1B 3JN
England

73. Executive Enterprises Publications Co., Inc.
33 West 60th St.
New York, N.Y. 10023
USA

74. Fairmont Press
Box 14227
Atlanta, Ga. 30324
USA

75. Federal Publications Sdn. Bhd.
No. 1 New Industrial Rd.
Off Upper Paya Lebar Rd.
Singapore

76. Financial Times Business Information Ltd.
Bracken House, 10 Cannon St.
London EC4P 4BY
England

77. Gale Research Co.,
Book Tower
Detroit, Mich. 48226
USA

78. Gastech Ltd.
2 Station Rd.
Rickmansworth
Herts WD3 1QP
England

79. Geothermal Resources Council
P.O. Box 98
Davis, Calif. 95617
USA

80. Gower Publishing Co., Ltd.
Gower House
Croft Rd., Aldershot
Hampshire Gu11 3HR
England

81. Graham & Trotman Ltd.
Sterling House
66 Wilton Rd.
London 3W1V 1DE
England

82. Grand Forks Energy Technology Center
U.S. Department of Energy
Grand Forks, N.D. 58202
USA

83. Gulf Publishing Co.,
Book Division
P.O. Box 2608
Houston, Tex. 77001
USA

84. Harvard Institute of Economic Research
Littauer Center Room 201
Cambridge, Mass. 02138
USA

85. Heyden & Son Inc.
247 South 41st St.
Philadelphia, Pa. 19104
USA

86. Illinois State Geological Survey
Natural Research Bldg.
Urbana, Ill. 61801
USA

87. Information Publications (PTE.) Ltd.
02-06, 1st Floor Pei Fu Bldg.
24 New Industrial Rd.
Off Upper Paya Lebar Rd.
Singapore 1953

88. Institute of Electrical and Electronics Engineers
Standards Dept.
345 East 47th St.
New York, N.Y. 10017
USA

89. Institute of Gas Technology
3424 S. State St.
Chicago, Ill. 60616
USA

90. Institute of Southeast Asian Studies
Heng Mui Keng Terrace
Pasir Panjang
Singapore 0511

91. Intercontinental Marketing Corporation
IPO Box 5056
Tokyo, Japan 100-31

92. Intercontinental Publications, Inc.
Dept. DM 483
15 Ketchum St.
P.O. Box 5017
Westport, Conn. 06881
USA

93. Intermediate Technology Publications
9 King St.
London WC2E 8HN
England

94. International Atomic Energy Agency
Division of Publications
Wagramerstrasse 5
P.O. Box 100
A-1400 Vienna
Austria

95. IPC Science and Technology Press Ltd.
P.O. Box 63
Westbury House, Bury St.
Guildford, Surrey
England, GU2 5BH

96. International Electrotechnical Commission
3 rue de Varembe
1211 Geneva
Switzerland

97. International Publications Service
114 E. 32nd St.
New York, N.Y. 10016
USA

98. International Review Service
301 United Nations Secretariat Bldg.
New York, N.Y. 10017
USA

99. International Solar Energy Society, Inc.
P.O. Box 52
Parkville 3052, Victoris
Australia

100. The JG Press
P.O. Box 351
Emmaus, Pa. 18049
USA

101. Japan Trade Center, Bangkok
Jetro Bldg.
159 Rajadamri Rd.
Bangkok 10500, Thailand

102. Johns Hopkins University Press
Baltimore, Md. 21218
USA

103. John Wiley & Sons, Inc.
605 Third Ave.
New York, N.Y. 10158
USA

104. Library of Congress Office
Exchange
American Embassy
Wireless Rd.
Bangkok 10500, Thailand

105. Longman House
Burnt Mill, Harlow
Essex, England

106. Lyndon B. Johnson School of Public Affairs
The University of Texas at Austin
Office of Publications
Drawer Y., University Station
Austin, Tex. 78712
USA

107. Macmillan Publishing Co., Ltd.
200D Brown St.
Riverside, N.J. 80370
USA

108. MAGSUB Ltd.
Grd. Floor Post Room
Oakfield House
35 Perrymount Rd., Haywards Heath
West Essex RH16 3DH
England

109. Martini Engineering
2303 Harris
Richland, Washington, D.C.
USA

110. Massachusetts Institute of Technology
Energy Laboratory
Rm. E40-495
Cambridge, Mass. 02139
USA

111. Mc Graw - Hill International Book Co.,
348 Jalan Boon Lay
Jurong
Singapore 2261

112. Mc Graw - Hill Publications Co.,
1221 Ave. of the Americas
New York, N.Y. 10020
USA

113. Miller Freeman Publications
500 Howard St.
San Francisco, Calif. 94105
USA

114. The MIT Press
28 Carleton St.
Cambridge, Mass. 02142
USA

115. The National Center for Appropriate
Technology
P.O. Box 3838
Butte, Mont. 59702
USA

116. National Coal Association
1130 17th St., N.W.
Washington, D.C. 20036
USA

117. National Library of Australia
Gift and Exchange Section
Canberra, A.C.T. 2600
Australia

118. National Library of Singapore
Stamford Rd.
Singapore 0617

119. National Productivity Council
Productivity House
Lodi Rd., New Delhi 110003
India

120. New Zealand Department of Scientific
and Industrial Research
Science Information Division
P.O. Box 9741
Wellington, New Zealand

121. New Zealand Energy Research and
Development Committee
University of Auckland
Private Bag, Auckland
New Zealand

122. Nichols Publishing Co.,
P.O. Box 96
New York, N.Y. 10024
USA

123. Oelgeschlager, Gunn & Hain, Inc. Publishers
1278 Massachusetts Ave.
Harvard Sqaure
Cambridge, Mass. 02138
USA

124. Oil & Gas Consultants International, Inc.
4554 South Harvard
Tulsa, Okla. 74135
USA

125. Oilfield Publications Ltd.
P.O. Box 11
Lenburry, Herefordshire HR8 1SN
England

126. Operations Research Society of America
P.O. Box 64237
Baltimore, Md. 21264
USA

127. Organization for Economic Co-peration and Development
Chateau de la Muette
2, rue André-Pascal
75775 Paris Cedex 16
France

128. Organization of Arab Petroleum Exporting Countries
Information Department
P.O. Box 20501
Kuwait

129. Organization of the Petroleum Exporting Countries
Obere Donaustrasse 93
1020 Vienna
Austria

130. The Open University
The Energy Research Group
Walton Hall
Milton Keynes, MK7 6AA
England

131. Pasha Publications
1401 Wilson Blvd., Suite 910
Arlington, Va. 22209
USA

132. The Pennsylvania State University
College of Earth and Mineral Sciences
Coal Research Section
517 Deike Bldg.
University Part, Pa. 16802
USA

133. Pennwell Books
P.O. Box 21288
Tulsa, Okla. 74121
USA

134. Pergamon Press
Maxwell House, Fairview Park
Elmsford, N.Y. 10523
USA

135. Pergamon Press Aust. Ltd.
P.O. Box 544
Potts Point, NSW 2011
Australia

136. Petroleum Economist
107 Charterhouse St.
London EC1M 6AA
England

137. Petroleum Information Corp.
International Publications
P.O. Box 1702
Houston, Tex. 77251
USA

138. Petroleum Intelligence Weekly
49 West 45th St.
New York, N.Y. 10036
USA

139. Petromin Asia
Unit 1203, 12th Floor
Tan Boon Liat Bldg.
315, Outram Rd.
Singapore 0316

140. Petromin Publishing Co., (Asia) PTE Ltd.
S. Widjojo Centre
9th Floor, Jalan Jendral Sudirman 57
Jakarta Pusat
Indonesia

141. Pertamina Bulletin
Pertamina Public Relations
Annex Building 4th floor
Jl. Merdeka Timur 1
P.O. Box 12, Jakarta
Indonesia

142. F troleum News
6/F, 146 Prince Edward Rd.
West, Kowloon
Hong Kong

143. Petroliam Nasional Berhad (PETRONAS)
Bangunan Petronas
P.O. Box 2444
No. 136 Jalan Pudu
Kuala Lumpur 05-03
Malaysia

144. Philippine Center for Appropriate Technology and Training
Publications Dept.
Ground Floor, Manila Suite
1416 Felipe Agoncillo St.
Ermita, Metro Manila
Philippines 2801

145. Plenum Pub. Co., Ltd.
88/90 Middlesex St.
London E1 7EZ
England

146. The Policy Studies Institute
Publications Department
1-2 Castle Lane
London SW1E 6DR
England

147. Prentice-Hall of Southeast Asia Pte. Ltd.
4 & 4B, Block 1
Ayer Rajah Industrial Estate
Ayer Rajah Rd.
Singapore 0513

148. Public Utilities Reports, Inc.
Suite 2100, Rosslyn Center Bldg.
1700 North Moore St.
Arlington, Va. 22209
USA

149. Robinson Book City Yajimaya
222 Siam Square Soi 1
Rama 1 Rd., Patumwan
Bangkok 10500, Thailand

150. Rossi-Nayve Consultancy Services, Inc.
International Recycling Group of Companies
P.O. Box 753, Bacolod City
Philippines

151. RPI/KROLL Publications, Inc.
733 Third Ave., Suite 901
New York, N.Y. 10017
USA

152. SATIS
Mauritskade 61a
1092 AD Amsterdam
Netherlands

153. The Society of Petroleum Engineers of AIME
6200 North Central Expressway
Dallas, Tex. 75206
USA

154. Solar Energy Information Services
4409 I St.
Sacramento, Calif 95815
USA

155. Solar Energy Research Institute
1617 Cole Boulevard
Golden, Colo. 80401
USA

156. Southern Illinois University Press
P.O. Box 3697
Carbondale, Ill. 62901
USA

157. St. Martin's Press, Inc.
175 Fifth Ave.
New York, N.Y. 10010
USA

158. Suksitsiam Co., Ltd.
1715 Rama 4 Rd.
Samyan, Bangkok 10500
Thailand

159. Swiss Center for Appropriate Technology
Varnbüelstrasse 14
CH-900 St. Gallen
Switzerland

160. SYNERJY
P.O. Box 4790
Grand Central Station
New York, N.Y. 10017
USA

161. Tab Books Inc.
Blue Ridge Summit, Pa. 17214
USA

162. Technical Insights, Inc.
158 Linwood Plaza
P.O. Box 1304
Fort Lee, N.J. 07024
USA

163. Thai Management Association
308 Silom
Bangkok 10500, Thailand

164. Times Publishing Bhd.
5A, 6-28 Akasaka 6-chome
Minato-ku, Tokyo 107
Japan

165. TOOL Foundation
Mauritskade 61a
1092 AD Amsterdam
Netherlands

166. Turbomachinery Laboratories
Dept. of Mechanical Engineering
Texas A & M University
College Station, Tex. 77843
USA

167. Toppan Company(s) Pte. Ltd.
38 Liu Fang Rd.
Box 22, Jurong Town Post Office
Jurong, Singapore 22

168. Transnational Network for Appropriate/
Alternative Technologies (TRANET)
P.O. Box 567
Rangeley, Me. 04970
USA

169. Tycooly International Publishing Ltd.
6 Crofton Terrace
Dun Laoghaire
Co. Dublin, Ireland

170. United Kingdom Atomic Energy Agency
Information Services Branch
11 Charles II St.
London, SW1Y 4QP
England

171. U.K. Department of Energy Library
Thames House South
Millbank, London SW1P 4QJ
England

172. U.K. Her Majesty's Stationery Office
Section PMIC
Atlantic House, Holborn Viaduct
London EC1P 1BN
England

173. UK-ISES
19 Albemarle St.
London W1X 3HA
England

174. UK : International Book Distributors Ltd.
66 Wood Lane End
Hemel Hemstead
Herts HP2 4RG
England

175. Unesco
Publications Section
7 Place de Fontenoy
Paris 75700, France

176. United Nations Conference on Trade and Development Information Service
United Nations Office at Geneva
Palais des Nations
Geneva, Switzerland

177. United Nations Publications
Room A-3315
New York, N.Y. 10017
USA

178. The United Nations University
Toho Seimei Building
15-1, Shibuya 2-chome
Shibuya-ku
Tokyo 150, Japan

179. UNIDO Information Bulletin
P.O. Box 300, A-1400
Vienna, Austria

180. University of Kentucky
Institute for Mining and Minerals Research
Publications Office
P.O. Box 13015, Iron Works Pike
Lexington, Ky. 40512
USA

181. The University of North Dakota
Engineering Experiment Station
Box 8103, University Station
Grand Forks, N.D. 58202
USA

182. US/AID
DIHF/ARDA
7222 47th St.
Suits 100
Chevy Chase, Md. 20815
USA

183. UPDATA Publications Inc.
1746 Westwood Boulevard
Los Angeles, Calif. 90024
USA

184. U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Rd.
Springfield, Va. 22161
USA

185. U.S. Superintendent of Documents
Government Printing Office
Washington, D.C. 20402
USA

186. VITA Publications
1815 North Lynn St., Suite 200
P.O. Box 12438
Arlington, Va. 22209
USA

187. Walker-Davis Publications, Inc.
2500 Office Center
Willow Grove, Pa. 19090
USA

188. Water Resources Publications
P.O. Box 2841
Littleton, Colo. 80161
USA

189. The Watt Committee on Energy Ltd.
The London Science Centre
18 Adam St.
London WC2N 6AH
England

190. Windbooks
P.O. Box 14
Rockville Centre, N.Y. 11571
USA

191. World Bank Publications
P.O. Box 37525
Washington, D.C. 20013
USA

192. World Energy Industry
4202 Sorrento Valley Blvd.
San Diego, Calif. 92121
USA

193. World Meteorological Organization
Publications Sales Unit
1211 Geneva 20
Switzerland

194. The World Watch Institute
1776 Massachusetts Ave., N.W.
Washington, D.C. 20036
USA

Annex IV-G

ENERGY RESEARCH CENTERS

Since its beginning, the NEIC has made the effort to compile and accumulate a list of energy research centers and information organization with which an exchange of information will be made possible. The following is a result of two years of investigation, correspondence, research and contact. It is arranged by topic and within each, the names of the centers and their addresses are alphabetically arranged.

It should be noted that there will be duplication between this list and the Directory of Energy Research Centers in Thailand and ASEAN, which is an NEIC publication.

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1. APPROPRIATE TECHNOLOGY

1. Appropriate Technology Development Organization
1-B, 47th Street, F-71
Islamabad, Pakistan

2. Asian Network for Industrial Technology Information and Extension
RELC International House
30 Orange Grove Rd.
Tanglin, P.O.B. 160
Singapore 9124

3. Barangay Technology Center
Philippine Women's University
Taft Avenue
Manila, Philippines

4. The Center for Maximum Potential Building systems
6438 Bee Caves Rd.
Austin, Texas 78746
USA

5. Development Technology Center
Institute of Technology, Bandung
Jl. Ganesha 10
Bandung, Indonesia

6. German Appropriate Technology Exchange
German Agency for Technical Cooperation
Daj Hammerskjold-Weg 1
6236 Eschborn 1
West Germany

7. National Center for Appropriate Technology (NCAT)
P.O. Box 3838
Butte, MT 59701
USA

8. Office of Appropriate Technology
1623 10th Street
Sacramento, California 95814
USA

9. Philippine Center for Appropriate Technology and Training
1416 F Agoncillo St.
Ermita, Metro Manila
Philippines

10. Regional Center for Technology Transfer
Bangalore 560052
India

11. Research Group for Rural Technology
34 Rue Dumont d'Urville
75116 Paris, France

12. Technology Research Center
TRC Bldg.
Buendia Ave. Extension
Makati, Metro Manila
Philippines

13. Tool Foundation
Mauritskade 61a 1092 AD
Amsterdam, The Netherlands

14. Transnational Network for Appropriate/Alternative Technlogies (TRANET)
Box 567, Rangeley
Maine 04970, USA

15. Volunteers in Technical Assistance (VITA)
3706 Rhode Island Ave.
Mt. Rainier, Maryland 20822
USA

2. ALTERNATIVE/RENEWABLE ENERGY

1. Alternative Fuels Data Bank
Bartlesville Energy Technology Center
P.O. Box 1398
Bartlesville, Oklahoma 74003
USA

2 Alternative Sources of Energy Inc.
Route 2, Box 90A
Milaca, MN 56353
USA

3. Asian Recycling Association
P.O. Box 753
Bacolod City, Negros Occidental
Philippines

4. Center for Non-Conventional Energy Development (CNED)
Ministry of Energy
Don Mariano Marcos Ave.
Diliman, Quezon City
Philippines

5. Chiang Mai University
Chiang Mai 50002
Thailand

6. Chulalongkorn University
Phyathai Rd.
Bangkok 10500
Thailand

7. Commonwealth Regional Renewable Energy
Information System (CRRERIS)
314 Albert Street
East Melbourne, Victoria
Australia 3002

8. ENERCON Council
Philippine National Oil Company
Rm. 1106
PNOC Bldg.
Makati Ave. Metro Manila
Philippines

9. Energy Alternatives Int'l Inc.
10200 W. Forty-Fourth Ave.
Wheat Ridge, Colo. 80033
USA

10. The Federation of Engineering Institution
of Southeast Asia and the Pacific (EEISEAP)
Don Mariano Marcos Ave.
Quezon City, Metro Manila
Philippines

Energy Resources Development Center (ERDC)
Don Mariano Marcos Ave.
Quezon City, Metro Manila
Philippines

11. Guangzhou Institute of Energy Conversion
Chinese Institute of Energy Conversion
Chinese Academy of Sciences
Information Division
P.O. Box 1254
81 Martyrs'Rd. C
Guangzhou, China 510027

12. International Recycling Group of Companies
Rossi-Nayve Consultancy Services Inc.
P.O. Box 753
Bacolod City
Philippines

13. Khon Khaen University
Khon Khaen 40002
Thailand

14. King Mongkut Institute of Technology
Thonburi Campus
Bangkok 10140
Thailand

15. National Center for Alternative Technology
(NCAT)
Llwyngwern Quarry
Machynlleth, Powys
Wales, United Kingdom

16. National Research Council
196 Paholyothin Rd.
Bangkok 10900
Thailand

17. Parliamentary Group for Alternative
Energy Strategies (PARLIGAES)
Abigail L.K. Lawton
32 Elm Grove, London N8 9AH
England

18. Prince of Songkhla University
Haadyai Campus
Haadyai 90110
Thailand

19. Renewable Energy Resources Information
Center (RERIC)
Asian Institute of Technolgoy
P.O. Box 2754
Bangkok, Thailand

20. The Royal Forestry Department
Paholyothin Rd.
Bangkok 10900
Thailand

21. The Thailand Institute of Scientific and
Technology Research
196 Paholyothin Rd.
Bangkok 10900
Thailand

22. UN Conference on New and Renewable Sources
of Energy Secretariat
Rm. DC-818 United Nations
New York, N.Y. 10017
USA

3. <u>ATOMIC</u>

1. Atomic Energy Commission of the Philippines
Information Center
Mariano Marcus Ave. Diliman
Quezon City, Philippines

2. British Nuclear Energy Society
1-7 Great George Street
London SW1P 3AA
England

3. International Atomic Energy Agency
P.O. Box 100
A-1400 Vienna, Austria

4. Uranium Institute
New Zealand House, Haymarket
London SW1Y 4TE
England

4. BIOMASS

1. Bioenergy Council
1625 EYE Street NW.
Suite 825 A
Washington, D.C. 20006
USA

2. Biomass Energy Technology Division
Office of Renewable Technology,
Conservation and Renewable Energy
Department of Energy
Forestall Bldg. CE-321, Rm. 5F043
Washington, D.C. 20585

5. COAL

1. Australian Mining Industry Council
Mining Industry House
216 Northbourne Ave.
Canberra, A.C.T. 2600
Australia

2. Bataan Mining Co., Ltd.
829 Aurora Blvd.
Cubao, Quezon City
Philippines

3. Bergbau-Forcschuj GmbH
Bibliothek and Dokumentation
Franz-Fischer-Weg 61
D-4300 Essen 13
Federal Republic of Germany

4. Bibliothek der Technischen Hochschule
Aachen
Templergraben 61
D-5100 Aachen
Federal Republic of Germany

5. Bituminous Coal Research Inc.
350 Hochberg Road
Monroeville, Pennsylvania 15146
USA

6. Board of Energy
Philcomcen Building
Pasig, Metro Manila
Philippines

7. Bureau of Energy Utilization
Ministry of Energy
Electra House
Makati, Philippines

8. Coal and Energy Conference
Benn Business Promotions Ltd.
25 High Street
Edenbridge, Kent "N 8, 5AB
England

9. Coal and Uranium Division
Ministry of Energy
Merritt Road, Fort Bonifacio
Metro Manila, Philippines

10. Coal Research Bureau
College of Mineral and Energy Resources
219 White Hall
West Virginia University
Morgantown, West Virginia 26506

11. Coal Research Institute of Daittan
Coal Corporation
594 Sangam-Dong
Mapo-Ku, Seoul
Korea

12. Department of Resources and Energy
G.P.O. Box 858
Canberra, ACT 2601
Australia

13. Directory for Energy Development
Ministry of Mines and Energy
Jakarta, Indonesia

14. Eyring Research Institute
1455 West 820 North
Provo, Utah 84601
USA

15. Filipinas Carbon and Mining Corporation
5th Floor, ADC Building
Ayala Ave., Makati, Metro Manila
Philippines

16. Grand Forks Energy Research Center
Box 8213 University Station
Grand Forks, North Dakota 58202
USA

17. IEA Coal Research
Economic Assessment Service
14/15 Lower Grosvenor Place
London SW1 0EX
England

18. Illinois State Geological Survey
Natural Resources Bldg.
University of Illinois
Urbana, Illinois 61801
USA

19. Iowa State University
Energy and Mineral Resources Research
Institute
Ames, Iowa 50011
USA

20. Ministry of Mines and Energy
Jalan Raya Menteng
Jakarta, Indonesia

21. National Coal Association
Coal Bldg.
1130 Seventeenth Street, N.W.
Washington, D.C. 20036
USA

22. National Coal Authority
Manila, Philippines

23. Office of Coal, Nuclear, Electric and Alternate Fuels
Dept. of Energy
Forestall Bldg.
EI-52, Rm. 2G053
Washington, D.C. 20585
USA

24. Office of Coal Processing and Fossil Energy
Dept. of Energy
Forestall Bldg.
GTN, FE-42, Rm. F305
Washington, D.C. 20585
USA

25. Pennsylvania State University
Coal Research Section
513 Deike Bldg.
University Park, Pennsylvania 16802
USA

26. PNOC Coal Corporation
Philippines National Oil Company (PNOC)
Don Mariano Marcus Ave.
Diliman, Quezon City
Philippines

27. ESCAP Regional Mineral Resources Development Center (RMRDC)
Jalan Jenderal Sudirman 623
Bandung, Indonesia

28. Research Council of Alberta
11315-87th Avenue
Edmonton, Alberta T6G, 2C2
Canada

29. Southern Illinois University at Carbondale
Coal Extraction and Utilization Center
Carbondale, Illinois 62901
USA

30. University of Alabama
Mineral Resources Institute and State Mines Experiment Station
Drawer AY
University of Alabama 35486
USA

31. University of Kentucky
Kentucky Center for Energy Research Lab
Institute for Mining and Minerals Research
P.O. Box 13015
Lexington, KY 40512
USA

32. University of North Dakota
Engineering Experiment Station
Box 8103 University Station
Grand Fords, North Dakota 58202
USA

33. University of Wyoming
Natural Resources Research Institute
Box 3038, University Station
Laramie, Wyoming 82071
USA

34. Utah Engineering Experiment Station
University of Utah
Salt Lake City, Utah 84112
USA

35. Villanueva Coal Mining Corporation
Rapu-Rapu, Batan Island
Albay
Philippines

36. West Virginia Geological and Economic Survey
P.O. Box 879
Morgantown, West Virginia 26505
USA

37. West Virginia University
Coal Research Bureau
Morgantown, West Virginia 26506
USA

6. <u>ELECTRICITY</u>

1. Central Power Research Institute (CPRI)
P.O. Box 1242
Bangalore 560012
Karnatoka, India

2. Electric Power Research Institute
Post Office Box 10412, Palo Alto
California 94303
USA

3. Manila Electric Company
P.O. Box 451
Manila, Philippines 12103

4. National Electricity Board of the States of Malaya
129 Jalan Bangsar
P.O. Box 1003
Kuala Lumpur, Malaysia

5. National Power Corporation of Manila
Manila, Philippines

6. Overseas Electrical Industry Survey Institute Inc.
No. 4-2 Uchisaiwaicho 1-chome
Chiyoda-ku, Tokyo 100
Japan

7. Power Research Institute
Scientific Services Division
P.O. Box 1/KBT Kebayoran
Jakarta, Indonesia

8. Public Utilities Board Singapore
Pub. Bldg.
Somerset Road
Singapore 0923
Republic of Singapore

7. ENERGY GENERAL

1. Asian and Pacific Development Center
UN
Pesiaran Data
P.O. Box 2224, Kuala Lumpur
Malaysia

2. Asian Data Service
Data Library - International LDCASIA Data
Resources Inc.
Suite 1060
1750 K Street N.W.
Washington, D.C. 20006
USA

3. Agricultural Information Bank for Asia -
Southeast Asian Regional Center for
Graduate Study and Research in Agriculture
(SEARCA)
College, Laguna 3720, Philippines

4. Australian Institute of Energy
P.O. Box 230, Wahroonga NSW 2076
Australia

5. Battelle Energy Information Center (BEIC)
Battelle - Geneva Research Centers
7 route de Drize
1227 Carouge - Geneva
Switzerland

6. Board on Science and Technology for
International Development (BOSTID)
National Research Council
2101 Constitution Ave. N.W.
Washington, D.C. 20418
USA

7. Brace Research Institute
Macdonald College of Mc Gill University
Ste. Anne de Bellevue
Quebec, Canada H9A 1C0

8. British Institute of Energy Economists
9 St. James's Square
London SW1Y 4LE
England

9. Ceylon Institute of Scientific and
Industrial Research
363 Bauddalokha Mawatha
P.O. Box 787
Colombo 7, Sri Lanka

10. Conference International des Grands
Reseaux Electriques a Haute Tension (CIGRE)
112 Boulevard Haussmann
75008, Paris
France

11. Clean Energy Research Institute
University of Miami
P.O. Box 248294
Coral Gables, Florida 33124
USA

12. Central Mechanical Engineering Research
Institute
Mahatma Gandhi Ave.
Durgapur 713209
West Bangal, India

13. Committee on Science and Technology in
Development Countries
Indian Institute of Science
Bangalore 560012
India

14. Commonwealth Scientific and Industrial
Organization (CSIRO)
CSIRO Central Information, Library and
Editorial Section
314 Albert Street
East Melbourne, Victoria
Australia 3002

15. Council for Scientific and Industrial
Research
Center for Scientific and Technical
Information
P.O. Box 395
001 Pretoria, South Africa

16. Department of Energy
Library Thames House South
Millbank
London SW1P, 4 QJ
England

17. Department of Scientific and Industrial
Research
Private Bag
Wellington, New Zealand

18. East-West Environment and Policy Institute
East-West Center
1777 East-West Road
Honolulu, Hawaii 96848
USA

19. Energy Probe
43 Queen's Park Crescent E.
Toronto M5S 2C3
Canada
or
53 Queen's Street
Suite 54
Ottawa, Canada

20. Energy Porductivity Center
Mellon Institute
Arlington, Virginia
USA

21. Energy Research Group
The Open University
Walton Hall, Milton Keynes MK7 6AA
England

22. Energy Research Information System (ERIS)
Old West Regional Commission
228 Hedden Empire Bldg.
Billing, Montana
USA

23. Energy Resources Conservation Board
603 Sixth Avenue S.W.
Alberta
Canada

24. Energy R&D Inventory (ERD)
Office of Environmental Information Systems
Energy Research and Development Adm.
Washington, D.C. 20545
USA

25. Energy R&D Inventory Project
Oak Ridge National Laboratory
Bldg. 3603
P.O. Box X
Oak Ridge, Tennessee 37830
USA

26. Eramus University
International Centre for Energy Studies
Postbus 1738-3000 DR
Rotterdam, Netherlands

27. Hawaii National Energy Institute
University of Hawaii at Manoa
2540 Dole Street, Homes Hall 246
Honolulu, Hawaii 96822
USA

28. HTFS Information Office
Bldg. 392
Aere Harwell
Oxon, OX II ORA
England

29. International Association of Energy
Economists
Petro-Canada
306-350 Sparks Street
Ottawa, Ontario K1R 7SB
Canada

30. International Conference on Energy Use
Management (ICEUM)
P.O. Box 64369
Los Angeles, California 90064
USA

31. Institute of Scientific and Technical
Information of China
P.O. Box 640
Beijing, China

32. International Development Research Centre
Asia Regional Office
Tanglin, P.O. Box 101
Singapore 9124

Head Office
Box 8500, Ottawa, Canada K1G 3H9
or
60 Queen Street
Ottawa, Canada

33. International Energy Agency
OECD
Chateau de la Muette
2 rue Andre Pascal
75775 Paris Cedex 16
France

34. Institute of Development Economics
42 Ichigaya Hommura-cho
Shinjuku-ku, Tokyo 162
Japan

35. Institute of Energy
18 Devonshire Street
London W1N 2AU
England

36. Institute of Energy Economics
No. 10 Mori Bldg.
1-18-1 Toranomon
Minato-ku, Tokyo 105
Japan

37. Kentucky Center for Energy Research
Box 11888
Iron Works Pike
Lexington, Kentucky 40511
USA

38. Korea Development Institute
207-41 Cheongryangri-dong
Dongdaemun-ku
P.O. Box 113, Seoul
Korea

39. Korea Energy Research Institute (KERI)
71-2 Jangdong-Ri, Tandong-Myeon
Daedeok-Gun, Chungnam, Seoul
C.P.O. 4311, Seoul
Korea

40. Korea Institute of Energy and Resources
Energy Laboratory
71-2, Jang-Dong, Jung-Gu
P.O. Box : Daejon 339
Daejon, 300-32, Korea

41. Korea Institute of Science and Technology
Regional Development Research Institute
39-1 Hawolgok Dong Sungbuk KU
Seoul
Korea

42. Korea Scientific and Technology Information
Center (KORSTIC)
Dept. of Information Resources
C.P.O. 1229
Seoul
Korea

43. Massachusetts Institute of Technology Energy
Laboratory (MIT)
1-23 Amherst St. Bldg. E40
Cambridge, Mass. 02139
USA

44. Ministry of Energy
Private Bag
Wellington
New Zealand

45. Ministry of Science, Technology and Energy
Information Centre
Yothi Road, Bangkok
Thailand

46. Ministry of Information Trade and
Industry (MITI)
3-1 Kasumigaseki 1-chome
Chiyoda-ku, Tokyo
Japan

47. National Energy Information Center
Information Referral Division
Energy Information Administration
Department of Energy
Forestall Bldg. E1-22, Rm. 1F048
Washington, D.C. 20585
USA

48. National Engineering Center
U.P. Diliman, Quezon City
Philippines

49. New Zealand Energy Research and
Development Committee
University of Auckland
Private Bag, Auckland
New Zealand

50. Organization de Cooperation et de
Development Economiques (OECD)
2 rue Andre Pascal 75775 Paris
France

51. Pakistan Council of Scientific and
Industrial Research
Directorate of Industrial Liaison
39 Garden Road, Karachi - 0310
Pakistan

52. Philippine Council for Industry and Energy
Research and Development
Rm. 513, 5th Floor, Ortigas Building
Ortigas Ave., Pasig, Metro Manila
Philippines

53. Regional Center for Energy, Heat and Mass
Transfer for Asia and the Pacific
Dept. of Mechanical Engineering
Indian Institute of Technology
Madras 600036
India

54. Resources for the Future
1755 Massachusette Ave. N.W.
Washington, D.C. 20036
USA

55. Rice University
Energy Research and Education Foundation
Rm. B49 Fondren Library
P.O. Box 1892
Houston, Texas 77001
USA

56. Stanford Energy Information Center (SEIC)
Institute for Energy Studies
Terman Engineering Center
Stanford University
Stanford, California 94305
USA

57. TATA Energy Research Institute
Documentation Center
Bombay House
25 Homi Mody Street
Bombay 400023
India

58. United Nations Conference on Science and
Technology for Development
Room DC-1148
United Nations
New York, N.Y. 10017
USA

59. United Nations University
Development Studies Division
Toho Seimei Bldg.
15-1 Shibuya-ku
Tokyo 150
Japan

60. United States - Department of Energy (US-DOE)
National Energy Information Center
EI-20
Forestal Bldg.
Washington, D.C. 20585
USA

61. University of California at San Diego
Energy Center - Dept. of Applied Mechanics
and Engineering
Sciences B-010
P.O.B. 109
La Jolla, California 92093
USA

62. University of Pennsylvania
Energy Center
Towne Bldg.
220 South 33rd. St.
Philadephia
Pennsylvania 19174
USA

63. University of Rochester
Energy Research and Development Project
601 Elmwood Ave.
Rochester, New York 14642
USA

64. University of Wisconsin
Energy Research Center
2420 Electrical Engineering Bldg.
Madison, Wisconsin 53706
USA

65. Utah Engineering Experiment Station
University of Utah
Salt Lake City, Utah 84112
USA

66. World Bank
1818 H. Street N.W.
Washington, D.C. 20433
USA

8. GAS

1. Central Fuel Research Institute
PO FRI-828108
Dhanbad, Bihar, India

2. Gas and Fuel Corporation of Victoria
Energy Management Center
58 Whiteside Road
Clayton South, Victoria
Australia 3169

3. Institute of Gas and Technology
3424 South State Street
Chicago, Illinois 60616
USA

4. Lemigas
Pusat Pengembangan Teknolgi Minyak dan Gas Bumi
(Oil and Gas Technology Development Centre 'Lemigas')
Cipulir, Kebayoran Lama, P.O.B. 89 Jkt
Djakarta, Selatan, Indonesia

5. Liquid Fuels Trust Board
P.O. Box 17
Wellington, New Zealand

6. National Organization Committee
Alcohol Fuel Technology Symposium
P.O.B. 5098
Wellington, New Zealand

7. Natural Gas Corporation of New Zealand
Petrocorp House
86 Lambton Quay
Wellington, New Zealand

9. GEOTHERMAL

1. BHRA Fluid Engineering
Cranfield Bedford MK 43 OAJ
United Kingdom

2. Geothermal Resources Council
P.O. Box 98
Davis, California 95617
USA

3. Geothermal World Corporation
5762 Firebird Court
Mission Oaks, Camarillo
California 93010, USA

10. PETROLEUM

1. Australian Institute of Petroleum Ltd.
227 Collins Street
Melbourne, Victoria 3000
Australia

2. The British Petroleum Co., Ltd.
Britannia House
Moor Lane
London EC 2Y 9 BU
England

3. Institute of Petroleum
61 Cavendish Street
London W1M 8AR
England

4. Organization of Arab Petroleum Exporting Countries (OAPEC)
Information and Public Relations Dept.
Box, 20501, Safat
Kuwait

5. Organization of Petroleum Exporting Countries (OPEC)
Obere Donaustrasse 93
A-1020 Vienna, Austria

6. P.N. Pertamina
2-4-6 Jalan Perwira
Jakarta, Indonesia

7. Petroleum Nasional (PETRONAS)
Bangunan Petronas
36 Jalan Pudu
P.O. Box 2444
Kuala Lumpur, Malaysia

8. Philippine National Oil Company (PNOC)
Energy and Development Center
Don Mariano Marcos Ave.
Diliman, Quezon City
Philippines

9. Petroleum Authority of Thailand (PTT)
Viphavadhi Rangsit Highway
Bangkok 10900, Thailand

10. Shell House
London S.E. 1 7 NA
England

11. SOLAR

1. Int'l Solar Energy Society
UK/ISES
19 Albemarle Street
London W1X 3HA
England

2. Solar Energy Research Institute
39-1 Hawolgok-Dong
Sungbuk-ku, Seoul
Korea

3. Solar Energy Research Institute Technical
Information Office (SERI)
1617 Cole Blvd.
Golden, Colorado 80401
USA

12. STANDARDS

1. American National Standards Institute
1430 Broadway
New York, N.Y. 10018
USA

2. International Electrotechnical Commission
Central Office
1 Rue de Varembe
Geneva, Switzerland

3. ISO Secretariat
Case Postale 56
1211 Geneva 20
Switzerland

4. ISO/Thailand
Chief of the Technical and Foreign
Affairs Division
Thai Industrial Standards Institute
Minsitry of Industry
Rama VI Rd.
Bangkok 4, Thailand

5. National Bureau of Standards
Washington, D.C.
USA

6. Singapore Institute of Standards and
Industrial Research (SISIR)
179 River Valley Rd.
Singapore 0617

7. Standards and Industrial Research
Institute of Malaysia (SIRIM)
Lot 10810 Phase III
Federal Highway
P.O. Box 35
Shah Alam
Selangor, Malaysia

Annex IV-H

Bibliographic Data Base Tools

In this Project, the NEIC had to establish the bibliographic data base. The following books were helpful for the NEIC Project personnel to lay out the principles of the data base. Items marked with an asterisk were utilized the most.

*Altherton, Pauline. *Handbook for Information Systems and Services.* Paris: Unesco, 1977.

Block, Carolyn C. *Coal Information Souces and Data Bases.* Park Ridge, N.J.: Noyes Data Corp., 1980.

*Chen, Ching-Chih, and Bressler, S., eds. *Micro-computers in Libraries.* New York: Neal-Schuman, 1983.

*Counihan, Martin. *A Directory of Energy.* Boston: Routledge & Kegan Paul, 1981.

Dierickx, Harold, and Hopkinson, Alan, comps. and eds. *Reference Manual for Machine-Readable Bibliographic Descriptions.* 2nd ed. and rev. Paris: Unesco, 1981.

*Economic and Social Commission for Asia and the Pacific. Library. *Reference Manual for the Entry of Records into the EBIS Data Base.* Rev. ed. Bangkok, 1983.

EPRI (Electric Power Research Institute) Thesaurus. Preliminary edition. Palo Alto, Calif: *Electric Power Research Institute.* October 1983.

Gibbs, D.C.C. *Glossary of Documentation Terms: Part II Computer-User Terms.* Advisory Group for Aerospace Research and Development, North Atlantic Treaty Organization, 1974.

*Gilpin, Alan, and Williams, Alan. *Dictionary of Energy Technology.* London: Butterworth Scientific, 1982.

Hunt, V. Daniel. *Energy Dictionary.* New York: Van Nostrand Reinhold, 1979.

International Development Research Center. *An Introduction to MINISIS.* Ottawa, Ontario, Canada: IDRC, 1982.

IEA Coal Research. Technical Information Service. *Coal Data Base: Theasaurus 1983.* London, 1983.

International Labor Office. ISIS Systems Group. *ISIS Terminal Users Guide.* Geneva: ILO, 1977.

International Organization for Standardization. *Data Processing - Vocabulary.* Geneva: ISO, 1982.

*Morin-Labatut, Gisele, and Sly, Maurien. *Manual for the Preparation of Records in Development-Information Systems.* Ottawa, Ont., International Development Research Centre, 1982.

*Pruett, Diane M., and Toyoshiba, Ted S., Jr. *Thesaurus for Energy and Rural Development.* Honolulu: East-West Resource Systems Institute, 1980.

*Ruhl, Mary Jane, "*Bibliographic Record Input Manual for the National Energy Information Center.*" Bangkok: National Energy Information Center, National Energy Administration, 1981. (Mimeo)

___________. "*Report of the National Energy Information Center Component.*" 1981. (Mimeo)

*Rossmassler, Stephen A., and Watson David G. *Data Handling for Science and Technology: an Overview and Sourcebook.* Amsterdam: North-Holland Publishing, 1980.

Samuelson, K., Borko, H., and Amey, G.X. *Information Systems and Networks.* Amsterdam: North-Holland Publishing, 1976.

Unesco. *Study on the Problems of Accessibility and Dissemination of Data for Science and Technology.* Paris, (n.d.)

Unesco Computerized Documentation System (CDS). Documentation Systems Division. *CDS/ISIS: a General Description.* Draft. Paris:Unesco, 1978.

Unesco Regional Office for Education in Asia and Oceania. *Module on Developing a Basic Knowledge of Population Educating.* Bangkok: Unesco Regional Office, 1979.

___________. *Module 1: Acquisition of Population Education Materials (Policy, Tools & System).* Bangkok, 1979.

___________. *Module 2: Basic Library Skills: Classifying and Cataloguing Knowledge Base Materials.* Bangkok, 1979.

Unesco Regional Office for Education in Asia and Oceania. *Module 3: Classifying and Cataloguing Population Education Materials.* Bangkok, 1979.

___________. *Module 4: Cataloguing Audio-Visual Materials.* Bangkok, 1979.

___________. *Module 5: Preservation and Storage of Materials in Tropical Countries.* Bangkok, 1979.

___________. *Module 6: Cataloguing and Classification System: a Programme Analysis.* Bangkok, 1979.

___________. *Module 7: Evaluation and Training.* Bangkok, 1979.

Unesco Regional Office for Education in Asia and Oceania. Population Education Programme Service. *Meeting Information Needs for Population Education.* 2 vols. Bangkok, 1979.

United States Agency for International Development (USAID) Project No. 493-0304, "Project Grant Agreement", between the Kingdom of Thailand and the United States of America for Renewable Nonconventional Energy, August 29, 1979.

__________, "Annexes to Project Paper for Renewable Nonconventional Energy Project No. 493-0304, USAID/Thailand, May, 1979 and July 1979.

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United Nations. *UNBIS Thesaurus*. New York, 1981.

U.S. Department of Commerce. National Technical Information Service. *Energy Microthesaurus: a Hierarchical List of Indexing Terms Used by NTIS*. Springfield, Va., 1976.

*__________. *A Workbook for Use in the NTIS International Technical Information Network*. Springfield, Va., 1981.

*U.S. Department of Energy. Technical Information Center. *Energy Data Base: Subject Thesaurus*. Tennessee, 1981.

__________. *Energy Information Data Base: Subject Dategories*. Oak Ridge, 1978.

Valantin, Robert L. *CDS/ISIS and MINISIS: a Functional Analysis and Comparison*. Ottawa, Ontario, Canada: International Development Research Centre, 1981.

*Valls, Jacques. *Information Services for Developing Countries*. Bangkok: Library & Regional Documentation Center, Asian Institute of Technology, 1981.

Viet, Jean. *Macrothesaurus for Information Processing in the Field of Economic and Social Development*. New English ed. Paris: OECD, 1978.

Volunteers in Technical Assistance. *Renewable Energy Dictionary*. Arlington, Va.: VITA, 1982.

Annex IV-I

Numeric Data Base Tools

Books which are listed are used by the NEIC programmers. Most of them are the procedures issued by the IBM Corporation for handling their equipment. As far as the computer textbooks (such as the language manuals, programming handbooks) are concerned; these will not be mentioned because their relevance is too general.

สำนักงานสถิติแห่งชาติ. ฝ่ายพัฒนาและอบรมคอมพิวเตอร์. *Data Base with DL/I for Application Programmers.* กรุงเทพ ฯ, 2521.

___________. *Data Base with DL/I Part II.* กรุงเทพ ฯ, 2521.

สำนักงานสถิติแห่งชาติ. ศูนย์ประมวลผลแห่งประเทศไทย. *File Organization and Data Structure Part II.* กรุงเทพ ฯ. 2520.

___________. *On-Line Processing with CICS/VS.* กรุงเทพ ฯ, (ม.ป.ป.)

สำนักงานสถิติแห่งชาติ. ศูนย์ประมวลด้วยเครื่องจักรแห่งประเทศไทย. งานพัฒนาและอบรมคอมพิวเตอร์. *VM/SP การใช้ Terminal.* กรุงเทพ ฯ, 2526.

___________. *VM/SP Xedit Subcommands.* กรุงเทพ ฯ, 2526

สำนักงานสถิติแห่งชาติ. ศูนย์ประมวลผลแห่งประเทศไทย. ฝ่ายพัฒนาและอบรมคอมพิวเตอร์. *STDUPT Manaual (Data Update Standard Program).* กรุงเทพ ฯ, 2524.

___________. *VSEDIT Manual (Data Editing Package Program).* กรุงเทพ ฯ, 2524.

CODATA/Unesco Training Course on Non-Bibliographic Data Banks. Stockholm: CODATA, 1983.

IBM Corporation. *IBM OS/VS COBOL Compiler and Library Programmer's Guide.* end ed. New York, 1976.

___________. *IBM VS COBOL for OS/VS.* 2nd ed. New York, 1978.

___________. *OS/VS1 Access Method Services: Release 6.* 4th ed. New York, 1978.

___________. *OS/VS1 JCL Reference: Release 6.7.* 5th ed. New York, 1979.

___________. *OS/VS1 Utilities: Release 6.* New York, 1977.

___________. *OS/VS Virtual Storage Access Method (VSAM) Programmer's Guide: VS1 Release 6, VS2 Release 3.7.* 4th ed. New York, 1976.

___________. *Query-by-Example: Program Description/Operation Manual.* New York, 1978.

___________. *Query-by-Example: Terminal User's Guide.* New York, 1978.

More tools will be added and utilized by both bibliographic and numeric data bases when the new computer system (HP 3000/40) which applies MINISIS software is installed.

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Annex V

NATIONAL ENERGY INFORMATION CENTER
ENERGY BIBLIOGRAPHIES 1983

NEIC/BIB/1/2
MARCH 1983

ENERGY SERIALS
(English and Thai)

National Energy Administration
National Energy Information Center
Energy Planning and Policy Division
Rama 1 Rd.
Bangkok 10500
Thailand
Tel. 223 0021 ext 203

Introduction

The National Energy Information Center is a project department of the National Energy Administration. The purpose of this Center is to collect, organize and disseminate energy information on the following topics:

Alternative sources of energy
- *coal*
- *Nuclear*

Conservation of energy
Energy policy and management
Oil and natural gas
Renewable sources of energy
- *Biomass*
- *Geothermal*
- *Hydropower*
- *Solar power*
- *Wind power*

At present, the Center has a growing collection of materials with plans to expand over the next 3 years into information retrieval, by automation. A major part of the work of the Center will be to publish bibliographies and lists on relevant topics for researchers and interested parties.

This is the second bibliography that the Center has produced - the first one was titled "Energy in Thailand - Selected References" and was issued in Sept 1982. It is available upon request.

The arrangement of this bibliography is alphabetical by title of serial. Frequency and holding at NEIC follow. The keywords are those by which data can be retrieved for the English language serials only from the shared information with the ESCAP Bibliographic Information System (EBIS) at ESCAP headquarters here in Bangkok.

We hope to issue more bibliographies in the future which will concentrate on specialized topics located in serial articles, in conference proceedings and in monographs, available at the Center.

Energy Serials List of NEIC

1. AIT review (Thailand), (Formerly: AIT newsletter)
   Quarterly
   No. 10-12, 14- ; 1972-1974, 1975-
   Keywords: ASIA, EDUCATION, TECHNOLOGY

2. AMTID : Application of modern technology to international development (USA)
   Monthly
   1977-
   Keywords: ABSTRACT, ENERGY

3. Asia-Pacific technology digest (India)
   Bimonthly
   V.3- ; 1982-
   Keywords: APPROPRIATE-TECHNOLOGY, ASIA, PACIFIC, TECHNOLOGY

4. Asia Pacific technology news (India)
   Quarterly
   V.3- ; 1982-
   Keywords: ASEAN, ASIA, ENERGY, TECHNOLOGY

5. Asset: abstracts of selected solar energy technology (Japan)
   Monthly
   V.2- ; 1980-
   Keywords: ABSTRACT, RENEWABLE-RESOURCES, SOLAR-ENERGY

6. Biomass digest (USA)
   Monthly
   V.4- ; 1982-
   Keywords: BIOMASS-ENERGY, RENEWABLE-RESOURCES

7. Bulk systems international (U.K.)
   Monthly
   V.4- ; 1982-
   Keywords: COAL, COAL-INDUSTRY, TRANSPORT

8. CCOP (Committee for Coordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas) (Thailand)
   Quarterly
   V.4- ; 1977-
   Keywords: MINING, PETROLEUM-EXPLORATION, SOUTH-EAST-ASIA

9. CEA notes d'information (France)
   11 iss./year
   1976-
   Keywords: FRANCE, NUCLEAR-ENERGY

10. Coal R & D (U.S.A.)
Semi-monthly
V.5- ; 1982-
Keywords: COAL-GASIFICATION, ENVIRONMENTAL-EFFECTS

11. Construction industry international (U.K.)
Monthly
V.2- ; 1976-
Keywords: CONSTRUCTION, CONSTRUCTION-INDUSTRY

12. D+C (Development and Cooperation) (Federal Republic of Germany)
Bi-monthly
1974-
Keywords: AGRICULTURAL-DEVELOPMENT, RURAL-DEVELOPMENT

13. Development digest (U.S.A.)
Quarterly
V.4- ; 1966-
Keywords: APPROPRIATE-TECHNOLOGY, RURAL-DEVELOPMENT

14. EEN: Electrical equipment news (Canada)
Monthly
V.25- ; 1960-
Keywords: CANADA, ELECTRICAL-INDUSTRY

15. E-Lab: Current research in the Energy Laboratory (USA)
Quarterly
1981-
Keywords: ENERGY, ENERGY-FORECASTS, ENERGY-POLICY

16. Economic impact (U.S.A.)
Quarterly
1979-
Keywords: ECONOMIC-CONDITIONS, TECHNOLOGY, USA

17. Electra: International Conference on Large High Voltage Electric Systems (France)
Bi-monthly
1964-
Keywords: ELECTRICITY, ELECTRIC-POWER-PLANTS

18. Energy Asia (Hong Kong)
Weekly
V.4- ; 1982-
Keywords: ASEAN, ASIA, ENERGY, PETROLEUM

19. Energy at Booz-Allen (USA)
Quarterly
V.1-2, 4- ; 1979-1980, 1982-
Keywords: ENERGY, RESEARCH

20. Energy economics (U.K.)
Quarterly
V.1- ; 1979-
Keywords: ENERGY-CONSERVATION, ENERGY-CONSUMPTION, ENERGY-ECONOMICS, ENERGY-FORECASTS, ENERGY-POLICY

21. Energy insider (U.S.A.)
Monthly
V.5- ; 1982-
Keywords: ENERGY-CONSERVATION, ENERGY-POLICY, (U.S.A.)

22. Energy management (India)
Quarterly
V.2- ; 1978-
Keywords: ENERGY-POLICY, MANAGEMENT, INDIA

23. Energy management (U.K.)
Monthly
1981-
Keywords: ENERGY, MANAGEMENT, UNITED-KINGDOM

24. Energy policy (U.K.)
Quarterly
V.1- ; 1973-
Keywords: ENERGY-POLICY, RESEARCH

25. Energy technology (Sweden)
Quarterly
1982-
Keywords: ENERGY, TECHNOLOGY, RESEARCH, SWEDEN

26. Energy week (U.S.A.)
Weekly
V.2- ; 1976-
Keywords: COSTS, ENERGY, PETROLEUM, (U.S.A.)

27. Environmental science and technology (U.S.A.)
Monthly
V.16- ; 1982-
Keywords: ENVIRONMENTAL-MANAGEMENT, ENVIRONMENTAL-PLANNING

28. Europe (Thailand)
Bi-monthly
V.2- ; 1980-
Keywords: ASIA, ECONOMICS, EUROPE, TECHNOLOGY, TRADE

29. Far eastern economic review (Hong Kong)
Weekly
V.108- ; 1980-
Keywords: ECONOMICS, FINANCE, SOUTH-EAST-ASIA

30. Far eastern technical review (U.K.)
Monthly
1960-
Keywords: ASIA, INDUSTRY, TECHNOLOGY

31. Gas energy review (U.S.A.)
Monthly
1982-
Keywords: NATURAL-GAS, STATISTICS, USA

32. Hydrocarbon processing. International edition (U.S.A.)
Monthly
V. 56-59, 62- ; 1977-1980, 1983-
Keywords: ENERGY, HYDROCARBONS, PETROLEUM-PRODUCTS

33. International butane/propane newsletter (U.S.A.)
Semi-monthly
V.6- ; 1982-
Keywords: BUTANE, LIQUEFIED-GASES, PROPANE

34. International coal review (U.S.A.)
Semi-monthly
1982-
Keywords: COAL, STATISTICS, USA

35. International power generation (U.K.)
10 iss./year
V.1- ; 1978-
Keywords: ELECTRICAL-INDUSTRY, ENERGY, POWER-INDUSTRY, TURBINES

36. International water power and dam construction
Monthly
V.27- ; 1975-
Keywords: DAMS, WATER-POWER

37. ISES news (Australia)
Quarterly
1975-
Keywords: SOLAR-ENERGY

38. Journal of petroleum technology (U.S.A.)
Monthly
V.30- ; 1978-
Keywords: DRILLING, PETROLEUM, PETROLEUM-EXPLORATION

39. Major energy statistics (Australia)
Monthly
1982-
Keywords: AUSTRALIA, ENERGY, PRICES, STATISTICS

40. Meiden review. International edition. (Japan)
3 iss./year
1975-
Keywords: ELECTRIC-POWER-PLANTS, JAPAN, POWER-INDUSTRY, TURBINES

41. Mitsui energy news (Japan)
Quarterly
1981-
Keywords: ENERGY, JAPAN

42. Modern Asia (Hong Kong)
Monthly
V.10- ; 1976-
Keywords: ASIA, BUSINESS, ECONOMICS, INDUSTRY

43. Modern power and engineering (Canada)
Monthly
V.70-71, 74- ; 1976-1977, 1980-
Keywords: ELECTRICITY, ENGINEERING, POWER-INDUSTRY

44. Modern power systems (U.K.)
Monthly
V.1- ; 1981-
Keywords: ELECTRICITY, ENGINEERING, POWER-INDUSTRY

45. National development (U.S.A.)
9 iss./year
V.9-10, 12- ; 1968-1969, 1971-
Keywords: ASIA, DEVELOPMENT, INDUSTRY, TECHNOLOGY

46. Nippon Kokan technical report (Japan)
3 iss./year
1980-
Keywords: ELECTRICITY, ENGINEERING, JAPAN, TECHNOLOGY

47. Nuclear news (U.S.A.)
15 iss./year
V.18- ; 1975-
Keywords: NUCLEAR-ENERGY, RESEARCH

48. Oil and gas analyst (U.S.A.)
Monthly
V.4- ; 1982-
Keywords: NATURAL-GAS, PETROLEUM, PRICES

49. Oil and gas journal (U.S.A.)
Weekly
V.70-73, 75-78, 80- ; 1972-1975, 1977-1980, 1982-
Keywords: FUELS, PETROLEUM-EXPLORATION, PRICES, PIPELINES, NATURAL-GAS

V

50. OPEC review (U.S.A.)
Quarterly
V.6- ; 1982-
Keywords: OPEC, PETROLEUM-INDUSTRY, PETROLEUM-RESOURCES, PRICES

51. Pertamina bulletin (Indonesia)
Monthly
V.11- ; 1982-
Keywords: ASIA, ENERGY, INDONESIA, PETROLEUM

52. Petroleum economist (U.K.)
Monthly
V.61- ; 1974-
Keywords: ENERGY, FUELS, PETROLEUM, STATISTICS

53. Petroleum intelligence weekly (U.S.A.)
Weekly
V.15- ; 1976-
Keywords: PETROLEUM, PETROLEUM-INDUSTRY, PRICES

54. Petromin Asia (Singapore)
Monthly
1982-
Keywords: ASIA, ENERGY-RESOURCES, PETROLEUM, SOUTH-EAST-ASIA

55. Pipeline and gas journal (U.S.A.)
14 iss./year
V.198- ; 1971-
Keywords: PIPELINES, NATURAL-GAS, PETROLEUM-INDUSTRY

56. Power engineering (U.S.A.)
Monthly
V.84- ; 1980-
Keywords: ENGINEERING, HYDRAULICS, POWER-INDUSTRY

57. Petroleum Gazette (Australia)
Quarterly
1982-
Keywords: AUSTRALIA, FUELS, PETROLEUM, PRICES

58. Proceedings of the Indian Academy of Sciences: Engineering Sciences (India)
Quarterly
V.2- ; 1979-
Keywords: ENERGY, ENGINEERING, INDIA, SYSTEMS-ANALYSIS

59. Public utilities fortnightly (U.S.A.)
Bi-monthly
V.67, 69-76, 97- ; 1961, 1962-1965, 1976-
Keywords: ELECTRICITY, PUBLIC-UTILITIES, U.S.A.

60. RE news : Renewable energy R & D (U.K.)
Irregular
1979-
Keywords: RENEWABLE-RESOURCES, UNITED-KINGDOM

61. Renewable energy review journal (Thailand)
Semi-annually
V.1- ; 1980-
Keywords: ASIA, RENEWABLE-RESOURCES

62. Renewable energy news (Canada)
Monthly
V.5- ; 1982-
Keywords: RENEWABLE-RESOURCES

63. RERIC news (Thailand)
3 iss./year
V.2- ; 1979
Keywords: ASIA, RENEWABLE-RESOURCES

64. Resources Asia (HONG KONG)
Monthly
1982-
Keywords: ASEAN, ASIA, ENERGY-RESOURCES, PETROLEUM-EXPLORATION

65. Solar energy (U.S.A.)
Monthly
V.17- ; 1975-
Keywords: SOLAR-ENERGY

66. Sunworld (U.S.A.)
Bi-monthly
V.1- ; 1976-
Keywords: SOLAR-ENERGY

67. Turbomachinery international (U.S.A.)
9 iss./year
V.20- ; 1979-
Keywords: ENGINEERING, GAS-TURBINES, HYDRAULICS, TURBINES

68. U.E.E.S. report. Utah Engineering Experiment Station (U.S.A.)
Irregular
V.1- ; 1978-
Keywords: COAL, RESEARCH, (U.S.A.)

69. World Construction (U.S.A.)
Monthly
V.12- ; 1966
Keywords: CONSTRUCTION, ENGINEERING, TECHNOLOGY

V

70. World Farming (U.S.A.)
Bi-monthly
V.15-21, 23- ; 1973-1979, 1981-
Keywords: AGRICULTURE, FARMING

71. World water (U.K.)
Monthly
V.5- ; 1982-
Keywords: WATER-RESOURCES

รายชื่อวารสารภาษาไทยทางด้านพลังงานของศูนย์ข้อมูลพลังงานแห่งประเทศไทย

๑. ข่าวกรมวิทยาศาสตร์บริการ

ราย ๔ เดือน

๒๕๑๗-

๒. ข่าวการไฟฟ้า

ราย ๖ เดือน

ปีที่ ๑๗- ; ๒๕๑๖-

๓. ข่าวสารการธรณี

รายเดือน

ปีที่ ๑๑, ๑๕- ; ๒๕๐๙, ๒๕๑๓-

๔. ข่าวสาร สสวท.

ราย ๓ เดือน

ปีที่ ๖, ๗- ; ๒๕๒๐, ๒๕๒๒-

๕. ข่าวสำนักงานคณะกรรมการวิจัยแห่งชาติ

รายเดือน

ปีที่ ๑๖- ; ๒๕๑๘-

๖. จดหมายข่าวโครงการเทคโนโลยีที่เหมาะสม

รายเดือน

ปีที่ ๑- ; ๒๕๒๔-

๗. จุลสารสภาวะแวดล้อม

ราย ๒ เดือน

ปีที่ ๑- ; ๒๕๒๕-

๘ นิวเคลียร์สาร

ราย ๓ เดือน

ปีที่ ๑- ; ๒๕๑๙-

๙. ภาวะธุรกิจและอุตสาหกรรม

รายเดือน

๒๕๒๕-

๑๐. รายงานเศรษฐกิจรายเดือน

รายเดือน

ปีที่ ๑๗- ; ๒๕๒๐-

๑๑. รายงานสถานการณ์น้ำมัน

รายสัปดาห์

๒๕๒๓-

๑๒. วารสารไทย

ราย ๓ เดือน

ปีที่ ๑- ; ๒๕๒๔-

๑๓. วารสารวิจัยและพัฒนา สจร

ราย ๖ เดือน

ปีที่ ๒- ; ๒๕๒๑-

๑๔. วารสารเศรษฐกิจธนาคารกรุงเทพ

รายเดือน

ปีที่ ๖- ; ๒๕๑๗-

๑๕. วารสารสงขลานครินทร์

ราย ๓ เดือน

ปีที่ ๓- ; ๒๕๒๔-

๑๖. วิศวกรรมสาร

ราย ๒ เดือน

ปีที่ ๑๕-๒๐, ๒๓-๓๑, ๓๕- ; ๒๕๐๕-๒๕๑๐, ๒๕๑๓-๒๕๒๑, ๒๕๒๕-

๑๗. วิศวกรรมสาร มช.

ราย ๓ เดือน

ปีที่ ๙- ; ๒๕๒๕-

๑๘. สรุปข่าวธุรกิจ

รายปักษ์

ปีที่ ๑๐- ; ๒๕๒๒-

๑๙. สรุปข่าวพลังงาน

รายเดือน

ปีที่ ๑- ; ๒๕๑๙-

๒๐. สาร ปกท.

ราย ๓ เดือน

ปีที่ ๖- ; ๒๕๒๕-

๒๑. เสรีภาพ

ราย ๓ เดือน

๒๕๒๔-

๒๒. อุตสาหกรรมสาร

รายเดือน

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Annex VI

ENERGY INFORMATION SYSTEMS
and
DATA BASES

(That offer on-line and off-line services)

The increasing relevance and emphasis that is being laid on the subject of energy, by practically every country in the world, has resulted in a flood of information - bibliographic and statistical. In an effort to control and document a part of this information and to aid the energy planners in locating what they need, this list is presented herewith. It is only a guide to selected data bases in energy and related fields. During the research for the data bases, not all information was readily available. This explains why a few lack addresses. Other Annexes of this report may have these addresses, so the readers can refer to these.. The data bases are arranged by topic coverage. They are followed by a list of directories, which are international in scope and which will help the novice in proceeding to locate additional sources. The National Energy Information Center (NEIC) will answer as many inquiries as possible about these data bases, as a considerable number of brochures can be located in the Vertical File Index.

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1. APPROPRIATE TECHNOLOGY

Regional Centre for Technology Transfer (RCTT)
Manickvelu Mansions
49 Palace Road
Bangalore, 560052, India

Asian Network for Industrial Technology
Information and Extension (TECHNONET ASIA)
Tanglin, P.O. Box 160
Singapore 9124
or
Techn[illegible]t Centre
Rm. 703, RELC Int'l House
30 Orange Grove Rd.
Singapore 1025

2. ATOMIC ENERGY

International Nuclear Information System (INIS)
International Atomic Energy Agency
P.O. Box 100
A-1400, Vienna
Austria

3. COAL

Coal Data Base
IEA Coal Research
14/15 Lower Grosvenor Place
London SW1 0EX
England

Ministry of Energy, Mines and Petroleum
Resources (COALFILE)
Victoria, British Columbia
Canada

Coal Technology Information Centers (COALABS)
Alberta Research Council
5th floor, Terrace Plaza
4445 Calgary Trail South, Edmonton
Alberta T6H 5R7
Canada

4. CONFERENCES

Conference Papers Index (CONF/CPI)
Cambridge Scientific Abstracts
5161 River Road, Bethesda
Maryland 20816
USA

Conference Proceedings Index
British Library Lending Division
Boston Spa, Wetherby
West Yorkshire LS23 7BQ
United Kingdom

5. DISSERTATIONS

Comprehensive Dissertation Index (CDI)
University Microfilms International
300 North Zeeb Road
Ann Arbor, Michigan 48106
USA

6. EARTH SCIENCES/AUSTRALIA

Australian Earth Sciences Information System
(AESIS)
Australian Mineral Foundation

7. ELECTRICITY

Electric Power Industry Abstracts (EPIA)
Edison Electric Institute
1111, 19th Street, N.W.
Washington, D.C. 20036
USA

Information Service Physics, Electrical &
Electronics, and Computers & Control Institute
of Electrical Engineers (INSPEC)
Station House, Nightingale Road
Hitchin, Herts SG5 1SA
United Kingdom

8. ENERGY

Energy Data Base (EDB)
U.S. Department of Energy
Washington, D.C. 20540
USA

Energy Data Base (EDB)
US Dept. of Energy, Technical Info. Center
P.O. Box 62
Oak Ridge, Tennessee 37830
USA

Energy Bibliography and Index Center for Energy and Mineral Resources (EDIB)
Texas A & M University Library
Reference Division
College Station, Texas 77843
USA

EIC/Intelligence (ENERGYLINE)
Environment Information Center, Inc.
48 West 38th Street
New York, N.Y. 10018
USA

Energy Library (POWER)
Room G-042 GTN
Washington, D.C. 20545
USA

9. ENERGY/CANADA

Canadian Energy Data Bank
(Data Resources Inc. - DRI)

10. ENERGY/JAPAN

Japanese Energy Data Bank or Nikkei Energy Data Bank
Nihon Keizai Shimbun (NKS) and Data Resources Inc. (DRI)

11. ENERGY/LATIN AMERICA

Latin American Energy Report
Business Publishers Inc. and News Net. Inc.

12. ENERGY/USA

DOE/Remote Console (RECON)
Department of Energy
Washington, D.C. 20540
USA

13. ENERGY/WORLD

World Energy Industry
World Energy Industry Information Surveys
San Diego, California
USA

14. ENGINEERING

Engineering Information, Inc. (COMPENDEX)
345 East 47th Street
New York, N.Y. 10017
USA

15. ENVIRONMENT

Environmental Bibliography (ENVIROBIB/EPB)
Environmental Studies Institute
2074 Alameda Padre Serra
Santa Barbara, California 93103
USA

EIC/Intelligence (ENVIROLINE)
Environment Information Center, Inc.
48 West 38th Street
New York, N.Y. 10018
USA

16. EUROPEAN COMMUNITY

Euro-Abstracts (EABS)
Commissio of the European Communities
DG XIII/A
P.O. Box 1907
Bat. Jean Monnet, B-4/068
Luxembourg

17. FLUID ENGINEERING

BHRA Fluid Engineering (FLUIDEX)
Cranfield
Bedfordshire MK43 0AJ
United Kingdom

18. FORESTRY

Forest Products (AIDS Forest Products)
Forest Products Research Society
2801 Marshall Court
Madison, Wisconsin 53705
USA

19. FUELS/USA

Alternative Fuels Data Bank (AFDB)
Dept. of Energy
Bartlesville Energy Technology Center
P.O. Box 1398
Bartlesville, Oklahoma 74005
USA

20. GENERAL

The British Library, Lending Division (BL)
Boston Spa. Wetherby
West Yorkshire LS23 7BQ
England

Central Information Service, CILES (CSIRO)
P.O. Box 89
East Melbourne, Victoria 3002
Australia

Data Resources Inc.
1750 K. Street, N.W.
9th Floor
Wash., D.C. 20006
USA

Develop Information Service (DEVELOP)
Denver Research Institute
Social Systems Research and Evaluation and
Conrol Data Corporation
University of Denver
University Park, Denver
Colorado 80208
USA

Dialog Information Services Inc. (DIALOG)
3460 Hillview Avenue
Palo Alto, Calif. 94303

ESCAP Bibliographic Information System (EBIS)
UN/ESCAP - Library
Rajadamnern Ave.
Bangkok 2
Thailand

Energy Data Base (EDB)
Department of Energy Technology Information
Center
U.S. Dept. of Energy
P.O. Box 62
Oak Ridge, Tennessee 37830
USA

National Technical Information Service (NTIS)
Office of Data Base Services
Dept. of Commerce
5285 Port Royal Road
Springfield, Virginia 22161
USA

Organization de Cooperation et de Development
Economiques (OECD)
2 Rue Andre Pascal, Paris 75775
France

System Development Corp.
2500 Colorado Avenue
Santa Monica, California 90406
USA

21. GEOLOGY

Geosystems (GEOARCHIVE)
P.O. Box 1024
Westminster, London SW1
United Kingdom

Geological Reference File (GEOREF)
American Geological Institute
One Skyline Place
5205 Leesburg Pike, Falls Church
Virginia 22041
USA

Geomechanics Abstracts (GMA)
Rock Mechanics Information Service
Royal School of Mines
Imperial College, Prince Consort Road
Londong SW7 2BP
United Kingdom

Institute for Scientific Information (ISI/Geo
Sci Tech)
3501 Market Street
University City Science Center
Philadelphia, Pennsylvania 19104
USA

22. GEOTECHNICAL ENGINEERING

Asian Information Center for Geotechnical
Engineering (AGE)
Asian Institute of Technology
P.O. Box 2754
Bangkok, Thailand

23. HYDRAULICS

Delft Hydraulics Laboratory (DYDRO/DEL)
P.O. Box 177
2600 MH Delft
The Netherlands

24. INDUSTRY

Industrial Technical Information Service (ITIS)
Singapore Institute of Standard and
Industrial Research
179 River Valley Road
Singapore 0617

25. INFORMATION SCIENCE

INSPEC Information Science
Institution of Electrical Engineers
Station House
Nightingale Road
Hitchin, Herts SG5 1SA
United Kingdom

26. MECHANICAL ENGINEERING

Information Science in Mechanical Engineering
(ISMEC)
Cambridge Scientific Abstracts
5161 River Road, Bethesda
Maryland 20816
USA

27. METEOROLOGY

Meteorological and Geoastrophysical Abstracts
(MGA)
American Meteorological Society
45 Beacon Street
Boston, Massachusetts 02108
USA

28. NORTH SEA OIL/UK/NORWAY

Produced by Norwegian Petroleum Directoriate
(INFOIL)
(Norwegian Center for Informatics)

29. NUCLEAR ENGINEERING

International Nuclear Information System
(INIS ATOMINDEX)
International Atomic Energy Agency
Vienna International Centre
Wagramerstrasse 5
P.O. Box 100, A-1400
Vienna, Austria

Nuclear Science Abstracts (NSA)
Technical Information Center
Oak Ridge, Tennessee 37830
USA

30. OCEANOLOGY

Cambridge Scientific Abstracts (OCEANIC ABSTRACTS)
5161 River Road
Bethesda, Maryland 20816
USA

31. OIL SANDS

Alberta Oil Sands Technology and Research Authority - Oil Sands Info. Center (AOSTRA)
Alberta Research Council
5th floor, Terrace Plaza
4445 Calgary Trail South
Edmonton, Alberta T6H 5R7
Canada

32. PETROLEUM

API Literature (APILIT)
American Petroleum Institute
Central Abstracting and Indexing Service
156 William Street
New York, New York 10038
USA

PETROLEUM ABSTRACTS
University of Tulsa
Information Services Division
Harwell Hall
Room 101
600 South College Avenue
Tulsa, Oklahoma 74104
USA

Petroleum/Energy Business News Index (P/E NEWS)
American Petroleum Institute
Central Abstracting and Indexing Services
156 William Street
New York, N.Y. 10038
USA

33. PETROLEUM/WORLD

Crude Oil Analysis Data Bank (COA)
Dept. of Energy
Bartlesville Energy Technology Center
P.O. Box 1398
Bartlesville, Oklahoma 74005
USA

Petroleum Information Corporation (PI)
P.O. Box 2612, Denver, CO 80201 USA

RAPID
Dataline, Inc.
Toronto, Canada

University of Tulsa - Information Services (TULSA)
Division and System Development Corp. (SDC)
Tulsa, Oklahoma

34. PETROLEUM EXPLORATION/USA

Computer Science Corporation from L.A. Martin and Associates (SEARCH)
Houston, Texas

35. PETROLEUM EXPLORATION/DRILLING/USA

Cisi/Energy Data Bases Exploration
(Formerly PCS/Energy Data Base Exploration)
CISinetwork Corp.
PCS Division
Van Nuys, Calif.
USA

36. PETROLEUM EXPLORATION/DRILLING/WORLD

Electronic Rig Statistics (ERS)
Pennwell Publishing Co.,
Tulsa, Oklahoma and Battelle Columbus Laboratories
Columbus, Ohio

37. PETROLEUM EXPLORATION/DRILLING/USA/CANADA

Hughes Rotary Rig Report (HUGHES)
International Association of Drilling Contractors
Hughes Tool Co.,/I.P. Sharp Associates

38. PETROLEUM EXPLORATION/DRILLING/WORLD

International Seismic Statistics (ISS)
Petroconsultants and Data Resources Inc. (DRI)

International Well Statistics (IWS)
Petroconsultants and Data Resources Inc. (DRI)

39. PETROLEUM PRICES/MARKETING

Electronic Markets and Information Systems (EMIS)
Inc. Software Services PTE Ltd.
77 Robinson Road No. 14-00
SIA Bldg., singapore 0106, Singapore
or
122, Ave., of the Americas
NY, N.Y. 10020

40. PETROLEUM/PRICES/WORLD

Petroflash Inc. (PETROFLASH)
P.O. Box 798
Lakewood, New Jersey 08701
USA

41. PETROLEUM/WELLS/US/CANADA

Petroleum Data System (PEDS)
University of Oklahoma Information Systems
Norman, Oklahoma

42. PHYSICS

Institute of Electrical Engineers (PHYSICS)
ABSTRACTS) (INSPEC)
Station House, Nightingale Road
Hitchin, Herts SG5 1SA
United Kingdom

43. POLLUTION

Cambridge Scientific Abstracts (POLLUTION
ABSTRACTS)
5161 River Road, Bethesda
Maryland 20816
USA

44. RENEWABLE ENERGY

Commonwealth Regional Renewable Energy Resources
Information System (CRRERIS)
314 Albert Street
East Melbourne, Victoria
Australia

Renewable Energy Resources Information Center
(RERIC)
Asian Institute of Technology
P.O. Box 2754
Bangkok, Thailand

45. SCIENCES

Index to Scientific & Technical Proceedings &
Books (ISI/ISTP & B)
Institute for Scientific Information
3501 Market Street
University Science Center
Philadelphia, Pennsylvania 19104
USA

Programme Applique a la Selection et a la
Compilation
Automatique de la Litterature (PASCAL)
Centre National de la Recherche Scientifique
Informascience
26 rue Boyer
75971 Paris Cedex 20, France

National Technical Information Service (NTIS)
US Dept. of Commerce
5285 Fort Royal Road
Springfield, Virginia 22161
USA

46. SOLAR ENERGY

Solar Energy Information Data Bank (SEIDE)
Solar Energy Research Institute
1617 Cole Boulevard
Golden, Colorado 80401
USA

Solar and Wind Energy Research Program
Information Center (SWERP)
Alberta Research Council
5th floor, Terrace Plaza
4445 Calgary Trail South
Edmonton, Alberta T6H 5R7
Canada

47. SPACE

National Aeronautics and Space Administration
(NASA)
NASA Scientific and Technical Information Branch
Washington, D.C. 20546
USA

48. STATISTICS/EUROPE/WORLD

Commission of the European Communities (EUROSTAT)
DG XIII/A
P.O. Box 1907
Bat. Jean Monnet
Luxembourg

49. STATISTICS/ENERGY/USA

Public Use Energy Statistics Data Base (PUESDB)
Dept. of Energy
Washington, D.C. 20540
USA

50. STATISTICS/PETROLEUM/WORLD

Produced by S.N. Elf Aquitaine (STATSID)
Institute Francais de Petrole and Compagnie
Francaise des Petrole-Total

51. TRANSPORTATION

Society of Automotive Engineers Inc. (SAE
ABSTRACTS)
400 Commonwealth Drive
Warrendale, Pennsylvania 15096
USA

Transportation Research Information Services
(TRIS)
US Dept. of Transportation, Research and
Special Programs Administration
Washington, D.C. 20590
USA

52. WATER

Water Research Center (AQUALINE)
Medmenham Laboratory
P.O. Box 16
Medmenham, Marlow
Bucks SL7 2HD
United Kingdom

Water Resources Scientific Information Center
(WATER RESOURCES ABSTRACTS)
Office of Water Research and Technology
US Dept. of the Interrior
Washington, D.C. 20240
USA

BASIC DIRECTORIES AND LISTS OF ENERGY INFORMATION AND ENERGY CENTERS

1. *Data Finder for Energy Statistic*
By Diane R. Burnett
Austin, Texas: Texas Energy and Natural Resources Advisory Council
Policy Analysis Division
200 East 18th Street
Austin, Texas 78701, USA Aug. 1982

2. *Datapro - Directory of Online Services*
Mc Graw Hill Book Co.,
1221 Ave. of the America
New York, N.Y. 10020, USA n.d.

3. *Directory of Energy Information Centers in the World. Statistical Publications of Energy by International Organization*
World Energy Conference
3rd edition, 1983

4. *Directory of Industrial and Technological Research Institutes. Industrial Conversion of Biomass*
INTIB (Industrial and Technological Info. Bank) and UNIDO
Development and Transfer of Technology Branch
P.O. Box 300, A-1400
Vienna, Austria n.d.

5. *Directory of Online Databases*
Vol. 4, Nos. 3 and 4 (serial)
Cuadra Associates Inc.
1523 Sixth St., Suite 12
Santa Monica, California
(Dist. by Pennwell Pub. Co.,)
P.O. Box 1260
Tulsa, Oklahoma 74101
USA

6. *Directory of Online Information Resources*
by Janet Kubalak
CSG Press
11301 Rockville Pike
Kensington, Maryland 20895 n.d.

7. *Energy Information Locator.* A select guide to information centers, systems data bases, abstracting services, directories, newsletters, binder services and journals.
EIC-Environment Information Centre, Inc.
292 Madison Ave.
New York, N.Y. 10017
USA n.d.

8. *Energy Statistics: A Guide to Information Sources.* by Sarojini Balachandran. (Vol. 1, in the Natural World Information Guide Series)
Gale Research Co.,
Detroit, Michigan, USA 1980

9. *Information Sources on Bioconversion of Agricultural Wastes.*
(UNIDO Guides to Information Sources No. 33)
United Nations
New York, N.Y.
USA 1979

10. *Information Sources on Nonconventional Sources of Energy*
(UNIDO Guides to Information Sources No. 30)
United Nations
New York, N.Y.
USA 1978

11. *International Directory of New and Renewable Energy Information Sources and Research Centers.* 1st ed.
UNESCO/SERI 1982

12. *Inventory of Data Sources in Science and Technology. A Preliminary Survey*
UNESCO/CODATA (Committed on Data for Science and Technology of the International Council of Scientific Unions), Paris, 1982

13. *Online Bibliographic Databases - A Directory and Sourcebook.* by James L. Hall and Marjorie J. Brown. London: ASLIB.
(Dist. by Gale Research Co.,
Book Tower, Detroit, Michigan 48226, USA)
1983

14. "Online Information for International Drilling", by Warren R. True.
Oil and Gas Journal, Dec. 5, 1983
pp. 138-142

15. *World Directory of Energy Information.*
2 volumes. Compiled by Cambridge Information and Research Services Ltd.
Westmead, United Kingdom: Gower Pub. Co.
1981

16. *World Energy Directory. A Guide to Organization and Research Activities in Non-Atomic Energy.* Edited by J.A. Bauly.
Essex, United Kingdom: Longman Group Ltd.
(France Hodgson) 1981

Annex VII

PROCEDURES MANUAL

OF

NEIC LIBRARY

(Only the Title Page and Table of Contents will appear in this report. All of these procedures are written in Thai.)

BY

PIYANART SANGUANMANEE

(UNDER USAID PROJECT NO. 493-0903)

JUNE 1984

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Annex VIII-A

Brief Instructions for the

NEIC Bibliographic Data Processing Functions

From December 1982 until March 1984, the NEIC has been sharing in the ESCAP Bibliographic Information System (EBIS) for several reasons:

1. NEIC did not have a stand-alone computer system for building a bibliographic data base.

2. NEIC was in desperate need of documenting bibliographically the energy data required by NEA.

3. NEIC staff were in need of intensive training in all aspects of building a bibliographic data base, from keying in data to retrieving it on line.

This resulted in the NEIC's creation of a mini-data base of approximately 1,200 records, utilizing the computer system at ESCAP, and utilizing all the tools pertaining to EBIS, namely:

Reference Manual for the Entry of Records into the EBIS Data Base 1983

Rather than go through the mechanics of preparing a manual, NEIC opted to use the above-mentioned one because of the following reasons:

1. The software utilized is compatible with MINISIS (selected by NEIC).

2. International standards have been utilized (International Standards Organization ISO 2709 and the Anglo-American Cataloguing Rules or AACR).

In addition to this, the Project consultant (in Dec. 1981) Ms. Mary Jane Ruhl did write a Bibliographic Record Input Manual for the National Energy Information Center which was also used partially. But for any final decision regarding any field and codes, except for the instructions written below, NEIC can easily use the EBIS manual.

Instructions to follow in filling out the attached suggested data sheets for obligatory/mandatory bibliographic data records:
(Filled out examples follow the description)

1. DATA TYPE

   This data sheet can be used for:

   - Monographs (any printed document including reports, conferences, etc.) (M)

   - Serials, series, journals, newspapers (any printed document that appears on a regular basis) (S)

   - Monograph Analytics (MA) - any chapter of a book or paper in a conference or parts of a printed document

- Serial Analytics (SA) any article in a serial
- Statistical Table (MAT) appearing in a monograph
- Statistical Table (SAT) appearing in a serial

2. DOCUMENT NUMBER

A 6-digit field to indicate the number of the record in the data base, in succession

000 - 001

000 - 002

000 - 003

3. INPUT IDENTIFICATION

A 2-digit field to indicate the number given to the data base or its sharers who will receive successive numbers. e.g.

I 01 NEIC

I 02 KMIT

4. TITLE

A 500-character (maximum) field that indicates the title of record-monograph, serial or table as it appears on the title page.

5. FORMER TITLE

This field is to be used only for serials that have changed to a new title.

6. AUTHOR

Personal name: An 80-character (maximum) that indicates the name of the person who is responsible for the writing of a publication.

Affiliation: Is the field provided (500 characters max) for the agency or institute with which the author is associated.

7. CORPORATE BODY is a 300-character (maximum) field which is used to indicate the organization as a responsible body or group for writing the document. These could be more than one, or could be smaller agencies belonging to parent organizations. Numbers in succession in 6-digits are assigned for each corp. body or (IRC = Inverted Retrieval Key for Corporate Bodies).

8. MEETING is a 300-character (maximum) field which is used to record the name, place, and date of a conference, seminar or workshop, from which the document resulted. Six-digit numbers in succession are also assigned for each meeting, or (IRM = Inverted Retrieval Key for Meeting).

9. PARENT TITLE is a 400-character (maximum) field that is used for analytical records (MA or SA) and indicates the origin of the title of the source, or the part which is being analyzed (e.g. Article in a serial or chapter in a book or statistical table in an article, or a chapter). Parent titles are also assigned 6-digit numbers in succession (IRB = Inverted Retrieval Key, Bibliographic).

10. FREQUENCY is a 6-character (maximum) field which is used to indicate the frequency of a serial only, i.e.,how often it is issued e.g.,

A	=	annually
Bi-a	=	Biannually
M	=	Monthly
Q	=	Quarterly

11. SERIES NO. is a 40-character (maximum) field which is used to record the volume and number of a particular issue of a serial publication e.g. 15(1) = (vol.15 No.1)

12. EDITION: This is a 25-character (maximum) field that is used to record the edition number of a monograph e.g.

2nd ed.

3rd rev. ed.

13. PUBLISHER: This is a 300-character (maximum) field used to record the name and the location of the publisher or the agency person responsible for the production and distribution of a publication.

14. LOCATION PUBLISHER: This is an 80-character (maximum) field used to report the place of publication. Abbreviations are used here and can be found in the EBIS manual.

15. COUNTRY CODE: This is a 3-character (maximum) code (based on ISO rules) that is used to identify the country from which the document emanated, e.g., Thailand = THA

16. DATE OF PUBLICATION: This is a 40-character (maximum) field used to record the date of publication in 6-digits (year, month, day, 2-digits each),e.g. 84/12/03 after which space is left for free-form additional information that may apply e.g., 84/12/03 Nov. - Dec. 1984.

17. COLLATION is a 90-character (maximum) field used to denote the physical description of a document, including pagination, number of volumes, duration of audio-visual (if any), map size, and the presence of illustrations, facsimiles and Tables. It is also used to record the number of pages for analytics (MA or SA) and the number given to a Table (MAT or SAT).

In this case, the PARENT TITLE is usaully the title of a serial or a book, and the GLOBAL NOTE will explain the bibliographical details of the chapter/article (author and title).

24. SUBJECT HEADINGS: This is a 150-character (maximum) field used to record subject headings which define the scope, in general, of a document. The selection of these, follows the individual needs for broad classification. Its main purpose is to facilitate retrieval of bibliographical lists for SDI sources (Selective Dissemination of Information). A list of the NEIC Subject Headings is attached at the end of this short manual.

HOLDER'S INFORMATION

This section of the data sheet includes administrative detailes specific to the library owning the document. Its use will be internal and not for dissemination purposes. The sections on DOCUMENT NO., INPUT ID have been explained before.

25. DATA TYPE H- This denotes that the information under H is for the holder of the document, i.e. the library or information center.

26. CALL NUMBER (For Monographs only at NEIC)

    This is a 20-character (maximum) field used to record the library call number of a document, based on the classification system used by it.

27. HOLDINGS (For Serials only) This is an 80-character (maximum) field, used to report the permanent holdings of a serial title in the library. It the serial is kept only for a limited period of time, the field RETENTION should be filled up with the year or months, wherever this is applicable.

28. ACQUISTIONS: This is a 5-character (maximum) field used to record the details of acquisition of a document. These are

    - FREE : Gift
    - EXCH : Exchange of info. agreement
    - PURCH : Purchased

    Only one should be circled.

29. PRICE: This is a 10-character (maximum) field used to record the price of a document when it is acquired. e.g. The price is \$ 16.50

    Enter under PRICE : 16.50

30. CURRENCY: This is a 3-character (maximum) field used to denote the currency code of a document. A list of the codes is available in

18. LANGUAGE CODE is a 10-character (maximum) field used to indicate the language of the text of the document. The EBIS manual contains the language codes that could be utilized, e.g.,

English	:	eng
Chinese	:	chi

19. ISBN or International Standard Book Number is a 13-character (maximum) field which serves to record the number assigned to a book through National Libraries. It is also a symbol to identify the publisher, e.g., 0-7204-2831-9 is a particular title published by North - Holland Pub. Company. This number is usually found on the back of the title page.

20. ISSN or International Standard Serial Number is a 9-character (Maximum) field which contains the International Standard Serial Number, a unique identification number internationally assigned to a serial title, e.g., ISSN 0046 - 9963. It is usually located on the title page of the serial.

21. DESCRIPTORS or KEYWORDS: This is a 600-character (maximum) field which utilizes a maximum of 20 descriptors for each document, from a thesaurus. The thesaurus is a list of terms in a controlled vocabulary, designed for retrieval purposes.

22. ABSTRACT: This is a 1,500-character (maximum) field which is used to describe in free text and in natural language the subjects covered by the document. Free terms which cannot be entered in the DESCRIPTOR field may be placed in the abstract, in order to increase retrieval capabilities. Abstracts are brief, accurate and non-critical. Sources for making abstracts could be:

- the author's abstract
- the table of contents
- the introduction
- preliminary reading in chapter one

Short sentences are recommended, and should not containing superfluous words which do not add to the meaning of the abstract. Also repetition of the same terms or descriptors (term and geographic) should be avoided if they are already covered in the DESCRIPTOR field.

23.* GLOBAL NOTE: This is a 400-character (maximum) field which is used to record any additional bibliographic notes associated with the document. NEIC used it heavily when recording a statistical Table.

* This is the only optional field.

the EBIS Manual. e.g. $ 16.50, enter under CURRENCY USD, or ฿ 400, enter THB.

31. PHYSICAL FORM: This is a 3-character (maximum) field used to describe the physical form of the document e.g.

Magnetic disk	:	mad
Magnetic tape	:	mat
Microfiche	:	mfc
Mimeographed	:	mim

32. CITY CODE: This is a 3-character (maximum) field used to report the city in which the document is found. In the case of NEIC, it will always be Bangkok or BKK.

33. ORGANIZATION CODE: This is a 6-character (maximum) field used to report the organization, or institution in which a document is located. In the case of NEIC, it is NEA.

34. LOCATION: This is a 10-character (maximum) field used to denote where the document is shelved, i.e. in which library. In the case of NEIC, it is NEIC (N.B. If in the future, other NEA divisions wish to participate, then their acronyms will be used, e.g. Energy Economics Dicision, becomes EED)

Some Comments Regarding the Output of Information

There are several kinds or types of output that will be required by NEIC, from the bibliographic data base, based on the details keyed in. These are :-

1. For use in (SDI) Selective Dissemination of Information Services

   1. A list of documents, arranged by author's family name.
   2. A list of documents, arranged by title.
   3. A list of documents, under any subject heading required.
   4. A list of documents, under any descriptor required, geographical or thesaurus term.
   5. A list of serials available at NEIC, arranged by title of serial, with their holdings details included.
   6. A list of statistical tables available in the documents, arranged under either descriptor.

(Thesaurus terms + STATISTICAL DATA) or subject heading
(Subject heading + STATISTICAL DATA)

2. For use internally by NEIC for purposes of bibliographic control

   1. A list of corporate bodies-authority file with the Inverted Retrieval Corporate Body No. (IRC).

   2. A list of meetings-authority file with the Inverted Retrieval Meeting No. (IRM).

   3. A list of descriptors/keywords or thesaurus terms used and the number of times each has occurred within the data base.

   4. A list of documents from the ACQUISTIONS field for those purchased, exchanged of acquired freely. For those purchased, a list of prices, to be used for budgetary purposes.

SAMPLES OF DATA SHEETS:

No. 1 - SERIAL TITLE

No. 2 - SERIAL ANALYTIC

No. 3 - MONOGRAPH TITLE - PERSONAL AUTHOR

No. 4 - SERIES

No. 5 - MONOGRAPH TITLE - CORPORATE BODY

No. 6 - MONOGRAPH ANALYTIC

No. 7 - STATISTICAL TABLE - MONOGRAPH ANALYTIC

No. 8 - STATISTICAL TABLE - SERIAL ANALYTIC

No. 9 - COLLECTION

No. 10 - MONOGRAPH IN A COLLECTION

No. 11 - ANNUAL REPORT

No. 1 - AUTHORITY FILE - CORPORATE BODY

No. 2 - AUTHORITY FILE - MEETING NAMES

SAMPLE NO. 1 - SERIAL TITLES

NEIC / 1A

1 = Form no.
A = Bibliographic Data Base

MONOGRAPHS/SERIALS/ANALYTICS

Doc. No.	B	0	0	0	-	0	0	1

Action	ADD REP DEL INS

Input ID	I	0	1

Data Type	B	-	S	

Title (mon or serial)	Public utilities fortnightly
Former Title (serials only)	
Author	
Personal Name	
Affiliation	
Corporate Body	
IRC	- IRC - IRC -
Meeting	
IRM	- IRM - IRM -
Parent Title	
IRB	-
Frequency	Bi-m
Series No.	Edition
Publisher	Public Utilities Reports, Inc.
Location Pub.	Arlington, Va. Country Code USA
Date Pub.	8 3 / 0 0 / 0 0
Collation	Language Code
ISBN	ISSN 0 0 3 3 3 8 0 8

Previous Page Blank

Descriptors	
	PUBLIC-UTILITIES, ENERGY, ELECTRICITY, ELECTRIC-POWER PLANTS PRICES, USA

Abstract	

Global Note	

Subject Headings	

HOLDERS INFORMATION

Doc. No.	B	0	0	0	-	0	0	1	-	0	1
Input ID	I										

Action	ADD REP DEL INS

Date Type	H	-

Call number (for monographs only)	

Holdings (for serials only)	
	v.67, 69-76, 97-; 1961, 1962-1965, 1976-

Retention	Current........year	Current ....months

Acquisitions	Price	Currency	Physical Form
Free Exch Purch			

City Code	Org.Code	Location
BKK	NEA	NEIC

Initial	Division	Date

SAMPLE NO. 2 - SERIAL ANALYTIC

NEIC / 1A

1 = Form no.
A = Bibliographic Data Base

MONOGRAPHS/SERIALS/ANALYTICS

Doc. No.	B	0	0	0	-	0	0	2

Action	ADD REP DEL INS

Input ID	I	0	1

Data Type	B	-	S	A

Title (mon or serial)	Thailand: charcoal from dried corncobs
Former Title (serials only)	
Author	
Personal Name	Curtis, Jerry L.
Affiliation	
Corporate Body	
IRC ___ - ___	IRC ___ - ___ IRC ___ - ___
Meeting	
IRM ___ - ___	IRM ___ - ___ IRM ___ - ___
Parent Title	Public utilities fortnightly
IRB	000 - 001
Frequency	
Series No.	3(3)
Edition	
Publisher	
Location Pub.	
Country Code	
Date Pub.	82/05/00 May-June 1982
Collation	p.9 - 13 : ill, tables
Language Code	eng.
ISBN	
ISSN	

Descriptors	CHARCOAL, THAILAND

Abstract

A simple method to produce charcoal from corncobs has been developed in Thailand. Three million tons of corn, produce annually 300,000 tons of charcoal.

Global Note	

Subject Headings	RENEWABLE ENERGY SOURCES

HOLDERS INFORMATION

Doc. No.	B	0	0	0	-	0	0	2	-	0	1
Input ID	I	0	1								

Action	ADD REP DEL INS

Date Type	H	-

Call number (for monographs only)	

Holdings (for serials only)	

Retention	Current........year	Current ....months

Acquisitions	Price	Currency	Physical Form
Free Exch.Purch			

City Code	Org.Code	Location
BKK	NEA	NEIC

Initial	Division	Date

SAMPLE NO. 3 - MONOGRAPH TITLE - PERSONAL AUTHOR

NEIC / 1A

1 = Form no.
A = Bibliographic Data Base

MONOGRAPHS/SERIALS/ANALYTICS

Doc. No.	B	0	0	0	-	0	0	3

Action	ADD REP DEL INS

Input ID	I	0	1

Data Type	B	-	M	

Title (mon or serial)	Wind energy: an assessment of the technical and economic potential
Former Title (serials only)	
Author	
Personal Name	Jarass, L.
Affiliation	
Corporate Body	
IRC	___ - ___ IRC ___ - ___ IRC ___ - ___
Meeting	
IRM	___ - ___ IRM ___ - ___ IRM ___ - ___
Parent Title	
IRB	___ - ___
Frequency	
Series No.	Edition:
Publisher	Springer - Verlag
Location Pub.	Berlin — Country Code: DEU
Date Pub.	81/00/00
Collation	209 p.:ill. — Language Code: eng.
ISBN	3 5 4 0 1 0 3 6 2 7 — ISSN:

Descriptors	RENEWABLE - ENERGY - SOURCES, WIND-ENERGY, GERMANY - FR

Abstract	The Federal Republic of Germany is cited as a case study of wind energy assessment from technical and economic aspects. Large scale technical utilization of wind power is closely looked at to determine the extent and location of wind utilization.

Global Note	A case study for the Federal Republic of Germany, commissioned by the International Energy Agency.
Subject Headings	WIND ENERGY * RENEWABLE ENERGY SOURCES

HOLDERS INFORMATION

Doc. No.	B	0	0	0	-	0	0	3	-	0	1
Input ID	I	0	1								

Action	ADD REP DEL INS

Date Type	H	-

Call number (for monographs only)	333.92 Jar
Holdings (for serials only)	

Retention	Current........year	Current ....months

Acquisitions	Price	Currency	Physical Form
Free Exch Purch	43.70	USD	

City Code	Org.Code	Location
BKK	NEA	NEIC

Initial	Division	Date

SAMPLE NO. 4 - SERIES

NEIC / 1A

1 = Form no.
A = Bibliographic Data Base

MONOGRAPHS/SERIALS/ANALYTICS

Doc. No.	B	0	0	0	-	0	0	4

Action	ADD REP DEL INS

Input ID	I	0	1

Data Type	B	-	S	

Title (mon or serial)	Energy resources development series
Former Title (serials only)	

Author	
Personal Name	
Affiliation	
Corporate Body	ESCAP, FAO UNEP

IRC	0	0	0	-	0	0	1	IRC	0	0	0	-	0	0	2	IRC	0	0	0	-	0	0	3

Meeting	

IRM				-				IRM				-				IRM				-			

Parent Title	

IRB				-			

Frequency			
Series No.		Edition	
Publisher			
Location Pub.	Bangkok	Country Code	THA
Date Pub.	8 1 / 0 0 / 0 0		
Collation		Language Code	eng
ISBN		ISSN	

MONOGRAPHS/SERIALS/ANALYTICS (cont.)

Descriptors	
	ENERGY - RESOURCES, ASIA

Abstract	

Global Note	

Subject Headings	

HOLDERS INFORMATION

Doc. No.	B	0	0	0	-	0	0	4	-	0	1
Input ID	I	0	1								

Action	ADD REP DEL INS

Date Type	H	-

Call number (for monographs only)	333.47 Ene

Holdings (for serials only)	No. 1 - ; 1981 -

Retention	Current........year	Current ....months

Acquisitions	Price	Currency	Physical Form
Free Exch Purch			

City Code	Org.Code	Location
BKK	NEA	NEIC

Initial	Division	Date

SAMPLE NO. 5 - MONOGRAPH TITLE - CORPORATE BODY

MONOGRAPHS/SERIALS/ANALYTICS

NEIC / 1A
1 = Form no.
A = Bibliographic Data Base

Doc. No.	B 0 0 0 - 0 0 5	Action	ADD REP DEL INS
Input ID	I 0 1	Data Type	B - M

Title (mon or serial)	Proceedings of the ESCAP/FAO/UNEP expert group meeting on fuelwood and charcoal
Former Title (serials only)	
Author	
Personal Name	
Affiliation	
Corporate Body	ESCAP, FAO UNEP

IRC	0 0 0 - 0 0 1	IRC	0 0 0 - 0 0 2	IRC	0 0 0 - 0 0 3

Meeting	Expert Group Meeting on Fuelwood and Charcoal (1981 May 5-11: Bangkok)

IRM	0 0 0 - 0 0 1	IRM	-	IRM	-

Parent Title	Energy resources development series
IRB	0 0 0 - 0 0 4

Frequency			
Series No.	no. 24	Edition	
Publisher			
Location Pub.	Bangkok	Country Code	THA
Date Pub.	8 2 / 0 0 / 0 0		
Collation	120 p.	Language Code	eng
ISBN		ISSN	

MONOGRAPHS/SERIALS/ANALYTICS (cont.)

Descriptors	
	FUELWOOD, RENEWABLE - ENERGY - SOURCES, ASIA, ESCAP-REGION

Abstract	
	Meeting stresses importance of fuelwood supply in rural areas. It draws attention of governments to the shortages of this energy source and recommends firm committment for appropriate action, through better management of resources.

Global Note	

Subject Headings	
	RENEWABLE ENERGY SOURCES

HOLDERS INFORMATION

Doc. No.	B	0	0	0	-	0	0	5	-	0	1
Input ID	I	0	1								

Action	ADD REP DEL INS

Date Type	H	-

Call number (for monographs only)	662,65 Eco

Holdings (for serials only)	

Retention	Current........year	Current ....months

Acquisitions	Price	Currency	Physical Form
Free Exch Purch			

City Code	Org.Code	Location
BKK	NEA	NEIC

Initial	Division	Date

SAMPLE NO. 6: MONOGRAPH ANALYTIC

NEIC / 1A

1 = Form no.
A = Bibliographic Data Base

MONOGRAPHS/SERIALS/ANALYTICS

Doc. No.	B 0 0 0 - 0 0 6
Action	ADD REP DEL INS
Input ID	I 0 1
Data Type	B - M A
Title (mon or serial)	Fuelwood in Asia: an identification of critical situations
Former Title (serials only)	
Author / Personal Name / Affiliation	de Montalembert, M.R.
Corporate Body	
IRC	-
IRC	-
IRC	-
Meeting	Expert Group Meeting on Fuelwood and Charcoal (1981 May 5-11: Bangkok)
IRM	-
IRM	-
IRM	-
Parent Title	Proceedings of the ESCAP/FAO/UNEP expert group meeting on fuelwood and charcoal
IRB	0 0 0 - 0 0 5
Frequency	
Series No.	
Edition	
Publisher	
Location Pub.	
Country Code	
Date Pub.	8 2 / 0 0 / 0 0
Collation	p. 17-24
Language Code	eng
ISBN	
ISSN	

MONOGRAPHS/SERIALS/ANALYTICS (cont.)

Descriptors	
	FUELWOOD, ASIA

Abstract

Reviews the present situation of fuelwood in Asian countries except China, by identifying the existing supplies and scarcity situations. Recommends further research and action in forestry programmes. Tables are included.

Global Note

Subject Headings	
	RENEWABLE ENERGY SOURCES

HOLDERS INFORMATION

Doc. No.	B	0	0	0	-	0	0	6	-	0	1		Action	ADD REP DEL INS
Input ID	I	0	1											

Date Type	H	-

Call number (for monographs only)	662.65 Eco
Holdings (for serials only)	
Retention	Current........year Current ....months

Acquisitions	Price	Currency	Physical Form
Free Exch Purch			

City Code	Org.Code	Location
BKK	NEA	NEIC

Initial	Division	Date

SAMPLE NO. 7: STATISTICAL TABLE/MONOGRAPH ANALYTIC

NEIC / 1A

1 = Form no.
A = Bibliographic Data Base

MONOGRAPHS/SERIALS/ANALYTICS

Doc. No.	B 0 0 0 - 0 0 7
Action	ADD REP DEL INS
Input ID	I 0 1
Data Type	B - M A T

Title (mon or serial)	Classification of Asia and Pacific countries according to their dependence on fuelwood over total energy consumption
Former Title (serials only)	
Author	
Personal Name	
Affiliation	
Corporate Body	
IRC	
Meeting	Expert Group Meeting on Fuelwood and Charcoal (1981 May 5-11: Bangkok)
IRM	
Parent Title	Proceeding of the ESCAP/FAO/UNEP expert group meeting on fuelwood and charcoal
IRB	0 0 0 - 0 0 5
Frequency	
Series No.	
Edition	
Publisher	
Location Pub.	
Country Code	
Date Pub.	8 2 / 0 0 / 0 0
Collation	p. 17: table 1
Language Code	eng
ISBN	
ISSN	

Descriptors	
	ENERGY - CONSUMPTION, FUELWOOD, RENEWABLE-ENERGY-SOURCES, ASIA, PACIFIC-REGION, STATISTICAL-DATA

Abstract	
	Table provides figures in percentages to show which Asian countries rely heavily (75 percent) or modestly (25 percent) on fuelwood for their energy needs, compared with total energy consumption.

Global Note	
	Table appears in the chapter' Fuelwood in Asia: an identification of critical situations' by M.R. de Montalembert

Subject Headings	
	ENERGY CONSERVATION, CONSUMPTION AND UTILIZATION, RENEWABLE ENERGY SOURCES, STATISTICAL DATA

HOLDERS INFORMATION

Doc. No.	B	0	0	0	-	0	0	7	-	0	1
Input ID	I	0	1								

Action	ADD REP DEL INS

Date Type	H	-

Call number (for monographs only)	662.65 Eco

Holdings (for serials only)	

Retention	Current........year	Current ....months

Acquisitions	Price	Currency	Physical Form
Free Exch Purch			

..tv Code	Org.Code	Location
BKK	NEA	NEIC

Initial	Division	Date

SAMPLE NO. 8: STATISTICAL TABLE/SERIAL ANALYTIC

NEIC / 1A
1 = Form no.
A = Bibliographic Data Base

MONOGRAPHS/SERIALS/ANALYTICS

Doc. No.	B	0	0	0	-	0	0	8

Action	ADD REP DEL INS

Input ID	I	0	1

Data Type	S	A	T	

Title (mon or serial)	Charcoal consumption in Thailand and in the next decade
Former Title (serials only)	
Author	
Personal Name	
Affiliation	
Corporate Body	
IRC	___ - ___ IRC ___ - ___ IRC ___ - ___
Meeting	
IRM	___ - ___ IRM ___ - ___ IRM ___ - ___
Parent Title	Public utilities fortnightly
IRB	0 0 0 - 0 0 1
Frequency	
Series No.	3 (3)
Edition	
Publisher	
Location Pub.	
Country Code	
Date Pub.	8 2 / 0 5 / 0 0 May - June 1982
Collation	p. 10: table 1
Language Code	eng
ISBN	
ISSN	

MONOGRAPHS/SERIALS/ANALYTICS (cont.)

Descriptors	ENERGY-CONSUMPTION, CHARCOAL, ENERGY-FORECASTS STATISTICAL-DATA, THAILAND, RENEWABLE-ENERGY-SOURCES
Abstract	Table provides a 10 year projection for the consumption of charcoal in rural Thailand. Years covered are 1980-1990
Global Note	Table appears in article' Thailand: charcoal from dried corncobs' by Jerry L. Curtis
Subject Headings	RENEWABLE ENERGY SOURCES - STATISTICAL DATA, ENERGY CONSERVATION CONSUMPTION AND UTILIZATION

HOLDERS INFORMATION

Doc. No.	B	0	0	0	-	0	0	8	-	0	1
Input ID	I	0	1								

Action	ADD REP DEL INS

Date Type	H	-

Call number (for monographs only)	
Holdings (for serials only)	
Retention	Current........year Current ....months

Acquisitions	Price	Currency	Physical Form
Free Exch Purch			

City Code	Org.Code	Location
BKK	NEA	NEIC

Initial	Division	Date

SAMPLE NO. 9: COLLECTION

NEIC / 1A

1 = Form no.
A = Bibliographic Data Base

MONOGRAPHS/SERIALS/ANALYTICS

Doc. No.	B	0	0	0	-	0	0	9

Action	ADD REP DEL INS

Input ID	I	0	1

Data Type	B	-	C	

Title (mon or serial)	Population and agricultural development: selected relationships and possible planning uses.
Former Title (serials only)	
Author	
Personal Name	
Affiliation	
Corporate Body	Food and Agriculture Organization of the United Nations

IRC	0	0	0	-	0	0	2	IRC				-				IRC				-			

Meeting	

IRM				-				IRM				-				IRM				-			

Parent Title	

IRB				-			

Frequency			
Series No.		Edition	
Publisher			
Location Pub.		Country Code	
Date Pub.	7 7 / 0 0 / 0 0		
Collation		Language Code	eng
ISBN		ISSN	

Descriptors	

Abstract	

Global Note	

Subject Headings	

HOLDERS INFORMATION

Doc. No.	B	0	0	0	-	0	0	9	-	0	1
Input ID	I	0	1								

Action	ADD REP DEL INS

Date Type	H	-

Call number (for monographs only)	320.7 Pop
Holdings (for serials only)	
Retention	Current........year Current ....months

Acquisitions	Price	Currency	Physical Form
Free Exch Purch			

City Code	Org.Code	Location
BKK	NEA	NEIC

Initial	Division	Date

SAMPLE NO. 10: MONOGRAPH IN A COLLECTION

NEIC / 1A

1 = Form no.
A = Bibliographic Data Base

MONOGRAPHS/SERIALS/ANALYTICS

Doc. No.	B	0	0	0	-	0	1	0

Action	ADD REP DEL INS

Input ID	I		

Data Type	B	-	M	C

Title (mon or serial)	The population problem and the development solution
Former Title (serials only)	

Author	
Personal Name	Smith, John M.
Affiliation	
Corporate Body	Food and Agriculture Organization of the United Nations

IRC	0	0	0	-	0	0	2	IRC				-				IRC				-			

Meeting	

IRM				-				IRM				-				IRM				-			

Parent Title	Population and agricultural development: selected relationshops and possible planning uses.

IRB	0	0	0	-	0	0	9

Frequency			
Series No.	Technical paper no. 2	Edition	
Publisher			
Location Pub.	Rome	Country Code	ITA
Date Pub.	78/00/00		
Collation	144 p.	Language Code	eng
ISBN		ISSN	

MONOGRAPHS/SERIALS/ANALYTICS (cont.)

Descriptors	DEMOGRAPHIC-PHENOMENON, ECONOMIC-RELATIONS, POPULATION-DYNAMICS, AGRICULTURAL-DEVELOPMENT, STATISTICAL-DATA
Abstract	A review is presented of the state of relationships between a set of variables: physiological, cultural, socio-economic and fertility. Details on a limited subset of such interactions involving agriculture, its structure, organization and growth.
Global Note	
Subject Headings	FAMILY-PLANNING

HOLDERS INFORMATION

Doc. No.	B	0	0	0	-	0	1	0	-	0	1
Input ID	I	0	1								

Action	ADD REP DEL INS

Date Type	H	-

Call number (for monographs only)	320.7 Pop
Holdings (for serials only)	
Retention	Current........year Current ....months

Acquisitions	Price	Currency	Physical Form
Free Exch Purch			

City Code	Org.Code	Location
BKK	NEA	NEIC

Initial	Division	Date

SAMPLE NO. 11: ANNUAL REPORT

NEIC / 1A

1 = Form no.
A = Bibliographic Data Base

MONOGRAPHS/SERIALS/ANALYTICS

Doc. No.	B 0 0 0 - 0 1 1
Action	ADD REP DEL INS
Input ID	I 0 1
Data Type	B - S
Title (mon or serial)	Annual Report
Former Title (serials only)	
Author	
Personal Name	
Affiliation	
Corporate Body	Petroleum Authority of Thailand
IRC	-
IRC	-
IRC	-
Meeting	
IRM	-
IRM	-
IRM	-
Parent Title	
IRB	-
Frequency	
Series No.	
Edition	
Publisher	
Location Pub.	Bangkok
Country Code	THA
Date Pub.	8 3 / 0 0 / 0 0
Collation	
Language Code	eng
ISBN	
ISSN	

MONOGRAPHS/SERIALS/ANALYTICS (cont.)

Descriptors	
	ANNUAL-REPORT, PETROLEUM, THAILAND

Abstract	

Global Note	

Subject Headings	
	PETROLEUM

HOLDERS INFORMATION

Doc. No.	B	0	0	0	-	0	1	1	-	0	1
Input ID	I	0	1								

Action	ADD REP DEL INS

Date Type	H	-

Call number (for monographs only)	660.13P
Holdings (for serials only)	1980 -
Retention	Current........year Current ....months

Acquisitions	Price	Currency	Physical Form
Free Exch Purch			

City Code	Org.Code	Location
BKK	NEA	NEIC

Initial	Division	Date

NEIC /2A

CORPORATE BODY- AUTHORITY FILE NO.1

AUTHORITY FILE: CORPORATE BODIES

DOC.NO.	C	0	0	0	-	0	0	1

ACTION	ADD REP DEL INS

INPUT ID.	I	0	1

Data Type	C	-	A

CORP. AUTHOR

Economic and social Commission for Asia and the Pacific

FORMER CB

Economic Commission for Asia and the Far East

FCB NO. | | | - | | |

EXPL. NOTE

The name was changed in 1967

Initial	Division	Date

MEETING TITLE-AUTHORITY FILE NO. 2 NEIC/3A

AUTHORITY FILE: MEETING NAMES

Doc. No.	M 8 1 0 0 0 1 (year: 81)

ACTION	ADD REP DEL INS

INPUT ID	I 0 1

IR.KEY	M – A (Data Type)

MEETING NAME Preceded by Corporate Body Y / N	Expert Group Meeting on Fuelwood and Charcoal
	CB.DDC.NO. C

SPONSOR Precedes Meeting Name Y / N	ESCAP, FAO, UNEP

MEETING PLACE		
Bangkok		
Meeting Date	Opening Year Mo. Day 8 1 0 5 0 5	Closing Year Mo. Day 8 1 0 5 1 1
Date Note		

MEETING NOTE (Session No., Part, Type, etc.

This is the second in a series of international conferences devoted to the role of fuelwood and charcoal in meeting energy needs in Asia.

Initial	Division	Date

SAMPLE OF DATA SHEET USED AT ESCAP IN EBIS

MONOGRAPH/DOCUMENT/ANALYTICS(1) : GLOBAL DESCRIPTION

CONTR.NO	B				–		

ACTION	ADD REP DEL INS

INPUT ID	I		

DATA TYPE	B	–			

TITLE	
ADDED TITLE	
AGENDA TITLE	

AUTHOR	
CORP.BODY	

IRC	X	C				–				IRC	X	C				–				IRC	X	C				–			

MEETING	

IRM	X	M				–				IRM	X	M				–				IRM	X	M				–			

PARENT TITLE	

IRB	X	B				–			

SERIES NO		EDITION			
PUBLISHER					
LOC.PUB		COUNTRY CD			
DATE.PUB	/ /				
COLLATION					
SALES NO					
ISBN		LANG.CD		DISTR.CD	
DOC.SYMB					

ESCAP/LIP/FORM/4A (Aug 1983)

MONOGRAPHS/DOCUMENTS/ANALYTICS (1) (cont)

DESCRIPTOR

ABSTRACT

GLOB. NOTE

MONOGRAPHS/DOCUMENTS/ANALYTICS (2) : HOLDER'S INFORMATION

CONTR.NO | B | | | | – | | | | – | | |

ACTION | ADD REP DEL INS

INPUT ID | I | | |

DATA TYPE | H | – |

CALL NO

LOC.NOTE

SUBJ.HEAD

ACQUISITION	PRICE	CURRENCY	PHYSICAL FORM
FREE EXCH PURCH			

CITY CD	ORG.CD	LOCATION	CLASS.SY
BKK			

INTERNAL NO | | | | | | | | | | |

OUTP.CD

FORW.DATE | | / | |

Y Y M M

Initial.	Div.	Data.

ESCAP/LIB/FORM/4B. (Aug 1983)

SAMPLE OF DATA SHEET, PREPARED BY M-J RUHL IN 1981

BASED ON AIT INFORMATION SYSTEMS

NEIC/Form-1

NEA/NEIC Bibliographical Record

						Data Base	00 0	Doc. No.	00 4
Date	00 10	Title Only	00 16	Type	00 17	Lang	00 18	Link	00 20

Authors Pers.	10				
Authors Corp.	11				
Author Variant	12				
Title (Eng.)	20				
Monograph Title	24				
Serial Title	30				
Publisher	31				
Year	32	Volume	33	Issue	37
		ISBN	38	Avail	40
		ISSN	39		
Pages	35			Alphabet	37
Products	41				
Supp. Info	44				
Author Affiliation	45				
Secondary Source	46				
Completed by	date	Entered by		date	

Thesaurus Keywords	60
Enriched Keywords	65
Geographical K/words	67
Abstractor	51
Abstract	50

Annex VIII-B

NEIC KEYWORD LIST

The following is a list of descriptors and keywords accumulated and coined by NEIC, for use in the bibliographic data base. Some explanations are given with them to clarify the context of their use. Against each, the source which was used to locate the keyword is given in acronyms. Full details for each source are located at the end of the list. To develop a thesaurus from this list, broader and narrower terms should be added. New terms may also be added as the need arises.

KEYWORD	SOURCES
ABSTRACTS	EBIS/E-W
AFRICA	EBIS
AGRICULTURAL-DEVELOPMENT	EBIS/E-W
AGRICULTURAL-WASTES	EBIS/E-W/EDB
AGRICULTURE	EBIS/E-W/EDB
AIR-CONDITIONING	EDB
ALCOHOL	EBIS/E-W
ALCOHOL-FUELS	EBIS/EDB
ALTERNATIVE-ENERGY-SOURCES (Use RENEWABLE-ENERGY-SOURCES)	EBIS
ALTERNATIVE-TECHNOLOGY (Use only to describe the machinery which utilizes sources other than conventional)	E-W
ANAEROBIC-DIGESTION	EBIS/E-W/EDB
ANIMAL-POWER	E-W
APPROPRIATE-TECHNOLOGY (Technology chosen for a particular purpose, serving the needs of a local area)	EBIS/E-W/EDB
AQUACULTURE	EBIS
AQUIFERS (Underground water bed)	EDB
ARCHITECTURE	EDB
ASEAN	EBIS
ASCOPE (Use ASEAN COUNCIL ON PETROLEUM)	EBIS
ASEAN COUNCIL ON PETROLEUM	
ASIA	EBIS/E-W/EDB

KEYWORD	SOURCES
AUSTRALIA	EBIS/E-W/EDB
AUTOMOBILE-INDUSTRY	EBIS
AUTOMOTIVE-FUELS	EBIS/E-W/EDB
BAGASSE	EBIS/E-W/EDB
BENZENE	EDB
BEVERAGE-INDUSTRY	EBIS
BIOGAS	EBIS/E-W
BIOMASS-ENERGY	EBIS/E-W
BIOMASS-FUELS	EBIS/E-W
BOILERS	EDB
BRUNEI	
BUILDINGS	EBIS
BURMA	EBIS/E-W/EDB
BUSINESS	EBIS/EDB
BUTANE	EBIS/E-W/EDB
CABLE-TELEVISION	UNBIS
CANADA	EBIS/E-W/EDB
CASSAVA (Use for TAPIOCA)	EBIS/E-W/EDB
CEMENT-INDUSTRY	EBIS
CHARCOAL	EDB/E-W
CHEMICAL-INDUSTRY	EBIS
COAL	EBIS/E-W/EDB
COAL-COMBUSTION	NEIC
COAL-FIRED-MHD-GENERATORS	EDB
COAL-GASIFICATION	EBIS/E-W/EDB
COAL-INDUSTRY	EBIS/EDB
COAL-LIQUEFACTION	EBIS/E-W/EDB
COAL-MINING	EBIS/EDB
COAL-PREPARATION (Means grinding, screening, powdering, cleaning etc. to prepare coal for industrial use)	EDB

KEYWORD	SOURCES
COGENERATION	EDB
COKE	EDB
COKING	EDB
COMBINED-CYCLE-POWER-PLANTS (Means also COGENERATION)	EDB
COMBUSTION	EBIS/E-W/EDB
COMPUTERS	EBIS
CONSTRUCTION	E-W/EDB
CONSTRUCTION-INDUSTRY	EBIS/EDB
COOKING-FUELS	E-W
COSTS (Use it to mean costs of a commodity from a consumer point of view)	EBIS/E-W
CRUDE OIL (Use PETROLEUM)	
DAIRY-INDUSTRY	EBIS
DAMS	EBIS/E-W/EDB
DATA-COLLECTION	E-W
DATA-PROCESSING	EBIS
DATA-TRANSMISSION	EDB
DEREGULATION (Mean decentralization of control of utilities to local bodies)	EDB
DESALINATION	EDB
DESALINIZATION (Use DESALINATION)	
DEVELOPING-COUNTRIES	EBIS/E-W/EDB
DEVELOPMENT	EBIS/E-W
DICTIONARIES	EBIS
DIESEL-ENGINES	EBIS/E-W/EDB
DIESEL-FUELS	EBIS/E-W/EDB
DIRECTORIES	EBIS/E-W/EDB
DISTILLERIES	EBIS

KEYWORD	SOURCES
DISTILLERY-WASTE (Use INDUSTRIAL-WASTES and DISTILLERIES)	
DRAUGHT-ANIMALS	EBIS
DRILL-CORES (Use in coal mining)	EDB
DRILLING	EBIS/EDB
DROUGHT	EBIS/E-W
EEC	EBIS
ECOLOGY	EBIS/E-W/EDB
ECONOMETRICS (Use also ENERGY-ECONOMICS and ENERGY-MODELS)	EBIS/E-W/EDB
ECONOMIC-CONDITIONS	EBIS/E-W
ECOSYSTEMS	EBIS/E-W/EDB
ELECTRIC-GENERATORS	EBIS/E-W/EDB
ELECTRIC-POWER	EBIS/E-W/EDB
ELECTRIC-POWER-DEMAND (Use POWER-DEMAND)	
ELECTRIC-POWER-PLANTS	EBIS/E-W
ELECTRIC-UTILITIES	EDB
ELECTRICAL-INDUSTRY	EBIS
ELECTRICITY (Use for description of physical phenomenon)	EBIS/E-W/EDB
ELECTRIFICATION	EBIS
ELECTRONICS	EBIS
ENERGY	EBIS/E-W/EDB
ENERGY-CONSERVATION	EBIS/E-W/EDB
ENERGY-CONSUMPTION	EBIS/E-W/EDB
ENERGY-CONVERSION	EDB
ENERGY-DEMAND	E-W/EDB
ENERGY-ECONOMICS	EBIS
ENERGY-FORECASTS	EBIS
ENERGY-FORESTS	EBIS/E-W
ENERGY-MANAGEMENT	EBIS/E-W/EDB

KEYWORD	SOURCES
ENERGY-MODELS	EBIS/E-W/EDB
ENERGY-PLANNING	EBIS/E-W
ENERGY-POLICY	EBIS/E-W/EDB
ENERGY-RESOURCES	EBIS/E-W
ENERGY-SOURCES	EBIS/E-W/EDB
ENERGY-STORAGE (Can be used for both situations of storage as in batteries and in resources)	EBIS/E-W/EDB
ENERGY-SUPPLY	EBIS
ENERGY-TECHNOLOGY	EBIS/E-W
ENERGY-TRANSPORT	EDB
ENERGY-UTILIZATION	EBIS
ENGINEERING	EBIS/E-W/EDB
ENHANCED-OIL-RECOVERY (Use ENHANCED-RECOVERY)	EDB
ENVIRONMENTAL-EFFECTS	EBIS/E-W/EDB
ENVIRONMENTAL-MANAGEMENT	EBIS
ENVIRONMENTAL-POLICY	EBIS/E-W/EDB
ENVIRONMENTAL-SCIENCES	EBIS
ESCAP-REGION	EBIS
ETHANOL	EBIS/E-W/EDB
ETHYLENE	EDB
EUROPE	EBIS
EXERGY (The portion of energy which is converted into the desired economically utilizable form)	EDB
FAMILY-PLANNING	EBIS
FARMING	EBIS
FERTILIZER-PLANT	EBIS
FIJI	EBIS/E-W/EDB
FISHING-INDUSTRY	E-W/EDB
FLUIDIZED-BED-COMBUSTION	E-W/EDB
FLYWHEELS	EDB

KEYWORD	SOURCES
FOOD	EBIS
FOOD-INDUSTRY	EBIS
FORESTRY	E-W/EDB/EBIS
FOSSIL-FUELS	EBIS/E-W/EDB
FRANCE	EBIS/E-W/EDB
FUEL-CONSUMPTION (Use ENERGY-CONSUMPTION and FUELS)	
FUELS	EBIS/E-W/EDB
FUELWOOD	EBIS/E-W
GASIFICATION	EBIS/E-W/EDB
GASOHOL	EBIS/E-W/EDB
GASOLINE	E-W/EDB
GAS-TURBINES	EDB
GEOLOGICAL-SURVEYS	EBIS/EDB
GEOLOGY	EBIS/EDB
GEOTHERMAL-ENERGY	EBIS/E-W/EDB
GEYSERS	EDB
GREENHOUSES	RERIC
HEAT-PUMPS	EDB/E-W
HEAT-TRANSFER	E-W/EDB
HEAVY-FUELS (See RESIDUAL-FUELS)	
HELIUM	EDB
HONG-KONG	EBIS/E-W/EDB
HUMAN-POWER	E-W
HUMAN-SETTLEMENTS	EBIS
HYDRAULICS	EBIS/EDB
HYDROCARBONS (Gases from Petroleum such as Propane, Benzene Ethylene)	EBIS/E-W/EDB
HYDROELECTRIC-POWER	EBIS/E-W/EDB
HYDROELECTRIC-POWER-PLANTS	EBIS/E-W/EDB

KEYWORD	SOURCES
HYDROGEN	EBIS/E-W/EDB
HYDROLOGY	EBIS
INDIA	EBIS/E-W/EDB
INDONESIA	EBIS/E-W/EDB
INDUSTRIAL-WASTES	EBIS
INDUSTRY	E-W/EBIS/EDB
INFORMATION-SYSTEMS	EBIS/E-W/EDB
INTERVIEWS	EBIS
INVENTIONS	EBIS/EDB
INVESTMENTS	EBIS
IRRIGATION	EBIS/E-W/EDB
ISRAEL	
JAPAN	EBIS/E-W/EDB
KOREA-R (Use for South Korea)	EBIS
LAND-RECLAMATION	EBIS/E-W/EDB
LEAD	EBIS
LEGISTLATION	EBIS
LIQUEFACTION (Use for other liquefaction processes than coal)	EDB/RERIC
LIQUEFIED GASES	EBIS
LIQUEFIED-NATURAL-GAS (LNG)	E-W/EDB
LIQUEFIED-PETROLEUM-GASES	EDB
LIQUID-FUELS	EBIS
LIQUID-WASTES	E-W
LOAD-MANAGEMENT	EDB
LURGI-PROCESS (Gasification process in Coal)	EDB
MALAYSIA	EBIS/E-W/EDB
MANAGEMENT	EBIS/E-W/EDB
MANPOWER	EBIS
MARKETING	EBIS/EDB

KEYWORD	SOURCES
MASS-COMMUNICATION	EBIS
MEDIA	EBIS
METAL-INDUSTRY	EDB
METALWORKING-INDUSTRY	EBIS
METHANE (Gas from biomass)	EBIS/E-W/EDB
METHANOL	EDB
MICROBIAL-PROCESSES	EBIS/E-W
MIDDLE-EAST	EBIS
MINERAL-RESOURCES	EBIS
MINING (Use only for MINERALS, for COAL use COAL-MINING)	EBIS/EDB
NATURAL-GAS	EBIS/E-W/EDB
NEW-ZEALAND	EBIS
NORTH-AMERICA	EBIS
NORTH-SEA	EDB
NUCLEAR-ENERGY	EBIS/E-W/EDB
NUCLEAR-POWER (Use NUCLEAR-ENERGY)	
NUCLEAR-POWER-PLANTS	EBIS/EDB
NUCLEAR-REACTORS	EBIS
OCEAN-THERMAL-ENERGY-CONVERSION (Based on Solar Radiation and how energy can be used from the temperature of the ocean)	E-W/EDB
OECD	EBIS
OFFSHORE-DRILLING	EDB
OIL (Use PETROLEUM)	
OIL-FIELDS	EDB/EBIS
OIL-SHALES	E-W/EBIS/EDB
OPEC	EBIS/EDB
OPERATIONAL-RESEARCH	EBIS

KEYWORD	SOURCES
PACIFIC-REGION	EBIS
PAKISTAN	EBIS/E-W/EDB
PALM-OIL	EBIS
PAPUA-NEW-GUINEA	EBIS/E-W/EDB
PEAK-LOAD	EDB
PEAT	EBIS/RERIC/EDB
PETROCHEMICAL-INDUSTRY	EBIS
PETROGRAPHY	EDB
PETROLEUM	EBIS/E-W/EDB
PETROLEUM-EXPLORATION	EBIS/E-W
PETROLEUM-INDUSTRY (Use when it involves the commercial business aspects of petroleum companies, may include finances and costs)	EBIS/EDB
PETROLEUM-PRODUCTS (Use when it involves processes in preparing the finished product/result. It may include finances)	EBIS/EDB
PETROLEUM-REFINERIES	EBIS/EDB
PETROLEUM-RESOURCES	EBIS
PHILIPPINES	EBIS/E-W/EDB
PHOTOVOLTAIC-CELLS	EBIS/E-W/EDB
PHOTOVOLTAIC-EFFECT	EBIS/EDB
PIPELINES	EBIS/EDB
POPULATION	EBIS
POWER-DEMAND (Use for Electric power demand)	EBIS
POWER-GENERATION (Use along with COGENERATION)	EBIS
POWER-INDUSTRY	EBIS
PRICE-REGULATIONS	EDB
PRICES (Use when it involves selling, from a company point of view)	EBIS
PRICE (Use PRICES)	

KEYWORD	SOURCES
PRODUCER-GAS	E-W/EDB
PRODUCTION	EBIS
PROJECT-DESIGN	EBIS
PROJECT-EVALUATION	EBIS
PROJECT-MANAGEMENT	EBIS
PROPANE (Use along with PETROLEUM and HYDROCARBONS)	EBIS/E-W/EDB
PROPERTY-RIGHTS	EBIS/EDB
PUBLIC-UTILITIES	EDB/E-W
PUMPS	EBIS/E-W/EDB
PYROLYSIS	EBIS/EDB/E-W
RECYCLING	E-W/EDB
REFRIGERATION	EBIS/E-W/EDB
REGULATIONS (Use in electric power)	EDB
RENEWABLE-ENERGY-SOURCES	EBIS/E-W/EDB
RESEARCH	EBIS/E-W
RESEARCH-AND-DEVELOPMENT	EBIS
RESERVES (Refers to available recoverable resources)	EDB
RESIDUAL-FUELS (Use to mean Heavy Fuels) (Def.: Remaining fuel after refining)	EDB/E-W
RIVER-BASINS	EBIS
RURAL-COMMUNITIES	EBIS/E-W
RURAL-DEVELOPMENT	EBIS/E-W
RURAL-ELECTRIFICATION	E-W
RURAL-ENERGY-CONSUMPTION	E-W
SAUDI-ARABIA	
SEABED	EBIS
SEDIMENTARY-BASINS	EBIS/EDB
SEWAGE	E-W/EDB

KEYWORD	SOURCES
SINGAPORE	EBIS/E-W/EDB
SLURRY-PIPELINES (Used for Coal)	EDB
SMALL-SCALE-HYDROELECTRIC-POWER-PLANTS (For EBIS only, use SMALL-PLANTS and HYDRO-ELECTRIC-POWER-PLANTS)	E-W
SOLAR-CELLS	EBIS/E-W/EDB
SOLAR-COLLECTORS	EBIS/RERIC/EDB
SOLAR-COOKERS	E-W/EDB
SOLAR-COOLING	E-W
SOLAR-DRYERS	EBIS/E-W/EDB
SOLAR-ENERGY	EBIS/E-W/EDB
SOLAR-HEATING	EBIS/E-W/EDB
SOALR-HOUSE	EBIS/RERIC
SOLAR-OVENS	E-W
SOLAR-PONDS	EBIS/E-W/EDB
SOLAR-POWER-PLANTS	EBIS/E-W/EDB
SOLAR-RADIATION	EBIS/E-W/EDB
SOLAR-REFLECTORS	E-W/EDB
SOLAR-REFRIGERATORS	EBIS/E-W/EDB
SOLAR-STILLS	EBIS/E-W/EDB
SOLAR-THERMAL-POWER-PLANTS	EBIS/E-W/EDB
SOUTH-EAST-ASIA	EBIS/E-W
SOUTH-PACIFIC-COMMISSION	EBIS
SPOT MARKET (Use for petroleum pricing system).	EDB
SRI-LANKA	EBIS/E-W/EDB
STATISTICAL-DATA (Use for tables only)	EBIS
STATISTICS (Use in conjunction with other descriptors, to denote numerical data and tables when they dominate the article)	EBIS/E-W/EDB

KEYWORD	SOURCES
STEAM-TURBINES	EDB/E-W
STOCKPILES (Use for reserves of Petroleum)	EDB
SUGAR	EBIS/E-W
SUPPLY-AND-DEMAND	EBIS/E-W/EDB
SWEDEN	EBIS/E-W/EDB
SYNTHETIC-FUELS (These can be produced from coal and from petroleum)	EBIS/E-W/EDB
SYNTHETIC-NATURAL-GAS (SNG)	E-W
SYSTEMS-ANALYSIS	EBIS/E-W/EDB
TAIWAN	EBIS/EDB
TAPIOCA (Use CASSAVA)	
TAXATION	EBIS
TECHNOLOGY	EBIS/E-W
TECHNOLOGY-TRANSFER	EBIS/E-W/EDB
TELEVISION	EDB/EBIS
TEXTILE-INDUSTRY	EBIS/E-W/EDB
THAILAND	EBIS/E-W/EDB
THERMAL-ENERGY-STORAGE-SYSTEMS	EBIS/E-W
THERMAL-POWER-PLANTS	EBIS/EDB
TIDAL-ENERGY	EBIS/E-W
TOBACCO-CURING	RERIC
TRANSPORT	EBIS/E-W/EDB
TUNNELLING	EBIS
TURBINES	EBIS/E-W/EDB
UNITED-KINGDOM	EBIS/E-W/EDB
USA	EBIS/E-W/EDB
USSR	
VEGETABLE-OILS	EBIS
WASTE-HEAT	EDB/E-W/RERIC

KEYWORD	SOURCES
WASTE-PROCESSING	EDB/E-W
WASTE-RECYCLING	NEIC/EBIS
WASTE-WATER	E-W/EDB
WASTES	E-W/EDB
WATER-CONSERVATION	EBIS
WATER-MANAGEMENT	NEIC/EBIS
WATER-RESOURCES	EBIS/E-W/EDB
WATERWHEELS	E-W/EDB
WAVE-ENERGY	RERIC
WAVE-POWER	EDB/RERIC
WELLS (Can be used for water wells and for petroleum wells)	EDB
WIND-ENERGY	EBIS/E-W
WINDMILLS	EBIS/E-W
WIND-TURBINES	E-W/EDB
WOODWORKING-INDUSTRY	EBIS

ACRONYMS FOR KEYWORD SOURCES

EBIS : ESCAP Library Bibliographic Information System List of Descriptors. 1983 and 1984
ESCAP, United Nations
Bangkok, Thailand

E-W and RERIC : Thesaurus for Energy and Rural Development, 1980 by D.M. Pruett and T.S. Toyoshibe, Jr.
East-West Resource System
East-West Center
Honolulu, Hawaii
N.B. Utilized with additions also, by The Renewable Energy Resources Information Center at the Asian Institute of Technology/Bangkok.

EDB : Energy Data Base Subject Thesaurus, 1981
Technical Information Center
U.S. Dept. of Energy
P.O. Box 62
Oak Ridge, TN 37830
USA

UNBIS : UNBIS Thesaurus. 1981
United Nations Bibliographic Information System
List of Terms used in Indexing and Cataloguing of Documents and other Materials relevant to United Nations Programms and Activities.
Dag Hammarskjold Library Bibliographical Series No. 37
United Nations, New York
USA

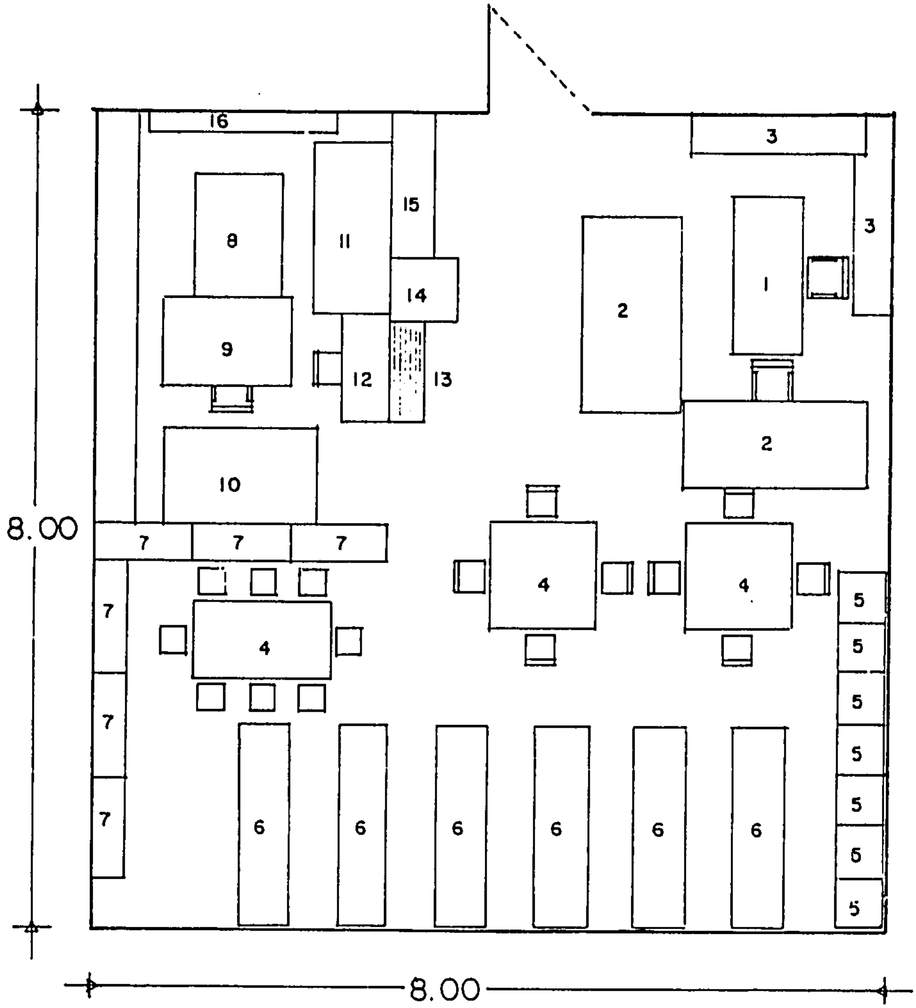
Annex VIII-C

SUBJECT HEADINGS UTILIZED BY NEIC

BIOMASS ENERGY
COAL AND COAL PRODUCTS
ECONOMIC CONDITIONS
ELECTRIC POWER
ENERGY CONSERVATION, CONSUMPTION AND UTILIZATION
ENERGY CONVERSION
ENERGY MANAGEMENT AND POLICY
ENERGY RESOURCES
ENERGY STORAGE
ENGINEERING
ENVIRONMENTAL SCIENCES
ENVIRONMENTAL-SOCIAL EFFECTS OF ENERGY TECHNOLOGIES
GEOSCIENCES
GEOTHERMAL ENERGY
HYDRO POWER
NATURAL GAS
NUCLEAR ENERGY
OIL SHALES AND TAR SANDS
PETROLEUM
RENEWABLE ENERGY SOURCES
SOLAR ENERGY
STATISTICAL DATA
SYNTHETIC FUELS
TIDAL ENERGY
WATER RESOURCES
WAVE ENERGY
WIND ENERGY

Annex IX

PLAN OF THE RENOVATION OF THE NEA LIBRARY



SCALE 2 CMS. = 1 M.

SIZE 8 M. X 8M. = 64 M^2

1. Librarian's desk
2. Circulation counters
3. Acquisitions shelves
4. Users' tables
5. Filing cabinets—standard and pamphlet file
6. Book stacks
7. Serial shelves
8. Microfiche reader/printer
9. Photocopier
10. Terminal
11. Micro filmer
12. Typewriter
13. Newspaper
14. Card cata. g
15. New books exihibition shelf
16. Air-conditioner

Annex X

Statistical Summary for the NEIC

Library and bibliographic data base

Acquisition of energy materials	
Books purchased (with USAID funds)	840 titles
Serial subsriptions (with USAID funds)	48 titles
Cataloguing of energy materials	
English language books	1,337 titles
Thai language books	553 titles
Circulation and reference	
Users/day	10
Titles circulated/day	25
Bibliographic data base	
Records input in data base	1,200
Records prepared not input	940
Records selected for preparation	2,300

Library renovation and library furniture and supplies (USAID funds)

Library renovation included vinyl flooring, curtain-hanging, cleaning and whitewashing of the walls, installation of doors and general repairs.

	฿	No.
Library steel shelves for books	24,000	7
Library steel shelves for serials	6,200	5
Card catalogues	5,200	2
Tables and chairs	13,360	2+8
Circulation counters	24,000	3
Book trolley	1,200	1
Kardex filing system	3,500	3
Filing cabinets	12,000	8
Typewriter desk	2,000	1
Bulletin board	7,500	1
Curtains	5,000	6
NEIC name si	3,700	1
Total	฿ 107,660	

Equipment purchased (USAID funds) (Duty-paid)

	฿	No.
Photocopier	85,000	1
Microfilm reader/printer	186,135	1
Typewriter	27,500	1
Microfilmer (camera)	230,800	1
Air-conditioners	78,200	2
Total	฿ 608,135	

Computer system installation (USAID funds)--(Dutyfree)

	฿	No.
Site preparation		
Air-conditioners	92,000	2
Line conditioner	80,300	1
Humidifier	11,280	1
Hewlett-Packard 3000/40 minicomputer system (inclusive of magnetic tape drive, dual flexible disc drive, line printer and 4 display stations)	3,490,820	
Staff training on the hardware	265,075	4+2
Total	฿ 3,939,475	
GRAND TOTAL	฿ 4,655,270	

NEA's contribution to NEIC for its annual operating budget (inclusive of staff salaries)

฿ 1,936,200 or $ 84,000

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Annex XI-A

May, 1982

<u>แบบสอบถามสำหรับสำรวจผู้ใช้</u>

(User Survey Questionnaire)

1. ชื่อ

2. ชื่อหน่วยงาน

3. ลักษณะของหน่วยงาน

4. ท่านอยู่ตำแหน่งไหน

5. อธิบายลักษณะงานที่กำลังทำอยู่

6. ระดับการศึกษา

7. วิชาเอก

8. เคยทำรายงานการสำรวจค้นคว้าเพื่องานของท่านไหม

9. ถ้าเคยทำภาษาอะไร

    ไทย   อังกฤษ   ฝรั่งเศส   อื่น ๆ

10. ข้อมูลชนิดไหนที่ท่านใช้ในหน้าที่การงาน

- สิ่งพิมพ์รัฐบาล
  - ☐ ภายในประเทศ
  - ☐ อื่น ๆ
- สถิติ
  - ☐ ภายในประเทศ
  - ☐ อื่น ๆ
- รายงานของบริษัท
  - ☐ ภายในประเทศ
  - ☐ อื่น ๆ
- คู่มือ, รายงานประจำปี
  - ☐ ภายในประเทศ
  - ☐ อื่น ๆ
- ลิขสิทธิ์
  - ☐ ภายในประเทศ
  - ☐ อื่น ๆ
- จดหมายแจ้งข่าวส่งเป็นคราว ๆ
  - ☐ ภายในประเทศ
  - ☐ อื่น ๆ
- วารสาร
  - ☐ ภายในประเทศ
  - ☐ อื่น ๆ
- ตำรา
  - ☐ ภายในประเทศ
  - ☐ อื่น ๆ
- อื่น ๆ (ช่วยบอกด้วยว่าอะไร)

11. งานของท่านจำเป็นต้องใช้บริการห้องสมุดหรือไม่

☐ เสมอ ๆ   ☐ บางครั้ง   ☐ ไม่เคยเลย

12. ท่านใช้ห้องสมุดเพื่อ

- ขอยืมอ่านหนังสือ
- ขอยืมอ่านวารสาร, หนังสือพิมพ์
- ขอยืมเอกสารอ้างอิง เช่น คู่มือ รายงานประจำปี ฯลฯ
- ถ่ายสำเนาสิ่งที่ต้องการ

13. ท่านพิจารณาอ่าน abstracts ☐

indexes ☐

14. งานของท่านจำเป็นต้องอ่านวารสารเสมอ ๆ หรือไม่

☐ ใช่ ☐ ไม่ใช่

15. งานของท่านจำเป็นต้องอ่านหนังสือพิมพ์

☐ ใช่ ☐ ไม่ใช่

16. ท่านสนใจในการประชุมหรือการพบปะสังสรรค์ทางวิชาการ

☐ ใช่ ☐ ไม่ใช่

17. ท่านจะทำอย่างไรเพื่อให้ได้รับข่าวสารทันสมัยอยู่เสมอ

18. ท่านเผยแพร่ข้อมูลภายในหน่วยงานหรือไม่ ☐ ใช่ ☐ ไม่ใช่

19. ท่านเผยแพร่ข้อมูลประชาชนภายนอก ☐ ใช่ ☐ ไม่ใช่

20. มีวิธีใดที่จะทำให้ความต้องการข้อมูลเป็นที่น่าพอใจท่าน

☐ มี ☐ ไม่มี

ถ้ามีทางช่วยบอกด้วยว่าทางไหน

21. ช่วงปีที่แล้ว งานของท่านต้องล่าช้าเพราะขาดข้อมูลมีไหม

☐ มี ☐ ไม่มี

ถ้ามีโปรดให้รายละเอียด

Annex XI-B

Nov. 25, 1983

To:

From: NEIC

Subject: NEIC data base

Please comment on the attached list of subject headings, which will be utilized for retrieval purposes, and tick off major topics you are interested in.

We are using this as a sample (yours is one out of four), before we begin a user survey in NEA.

Our records indicate that we now have approximately 1,200. We are aiming to reach 2,500 by June 1984 - out of which 500 will be based solely on statistical tables taken from serials and monographs, covering the following:

- World energy statistics on reserves and demand up to the year 2000.
- Particular resource statistics for ASEAN on availability, import/export, prices and consumption.
- Years 1983 and onwards.

The EBIS people said that this is feasible, and can be considered as bibliographical entries. The drawback will be that the user will not see the Table directly, but will be directed to its location. It will also carry keywords and an abstract.

PLEASE COMMENT.

Thank you.

SUBJECT HEADINGS UTILIZED

IN NEIC DATA BASE

BIOMASS ENERGY

COAL AND COAL PRODUCTS

ELECTRIC POWER

ENERGY CONSERVATION, CONSUMPTION AND UTILIZATION

ENERGY CONVERSION

ENERGY MANAGEMENT AND POLICY

ENERGY RESOURCES

ENERGY STORAGE

ENGINEERING

ENVIRONMENTAL SCIENCES

ENVIRONMENTAL-SOCIAL EFFECTS OF ENERGY TECHNOLOGIES

GEOSCIENCES

GEOTHERMAL ENERGY

HYDRO POWER

NATURAL GAS

NUCLEAR ENERGY

OIL SHALES AND TAR SANDS

PETROLEUM

RENEWABLE ENERGY SOURCES

SOLAR ENERGY

SYNTHETIC FUELS

TIDAL POWER

WATER RESOURCES

WAVE ENERGY

WIND ENERGY

Annex XII

EBIS/SERVICES: PUBLICATIONS ON ENERGY POLICY

September 1983

CONTENTS | PAGE

ELECTRIC POWER

1. EGAT : keeping its options open

McCulloch, Russell
From: Business in Thailand
13(5):62-73
May 1982
ELECTRIC POWER PLANTS/ THAILAND

EGAT has announced a reduction in the price of electricity for average households. Article discusses EGAT's problem in getting fuel for power generation. Focus is given on energy planning and policy making.

ENERGY CONSERVATION, CONSUMPTION AND UTILIZATION

2. Development of energy in Thailand in the '80s

Ruyabhorn, Pravit
Thailand. National Energy Administration
Bangkok
1980
71p. : tables
ENERGY CONSUMPTION/ ENERGY POLICY/ THAILAND

This report describes energy consumption in various sectors. It foresees energy policy and some problems.
333.79 Pra

3. The dynamics of energy utilization in the Philippines

Lorilla, Francis M.
Asian Institute of Technology
BANGKOK
1975
91p.
ENERGY MODELS/ ENERGY PLANNING/ PHILIPPINES

A dynamic simulation model is formulated to delineate structure of five sectors of energy consumers : agriculture, industry, utilities, transportation and services. Results provide a framework to measure energy consumption for planning purposes.
AIT Thesis no. 1133

ENERGY CONSERVATION, CONSUMPTION AND UTILIZATION (CONT.)

4. A study on the dynamics of energy utilization in Thailand

Wonkwon, Chackaoong
Asian Institute of Technology
Bangkok
1978
127p. in various pagings
ENERGY MODELS/ ENERGY POLICY/ THAILAND

Presents a model for energy utilization and planning. Sectors involved are transportation, agriculture, industry, utilities and services.
AIT Thesis no. 1372

ENERGY MANAGEMENT AND POLICY

5. Der Energiebedarf Thailands : eine okonometrische modellstudie = Energy demand in Thailand and econometric model study

Grunwald, Volker
Frankfurt am Main
Peter D. Lang
1980
397p.
ECONOMETRICS/ ENERGY MODELS/ THAILAND

A model system was produced as an instrument for planning design on the energy sector, especially for energy projections covering all sectors of the economy. This is a macro-economic and energy model designed during two visits to Thailand in 1977 and 1978.
333.7912 Gru

6. Energy forecasting for Pelita IV

Darianto
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning
p.603-610
ENERGY FORECASTS/ ENERGY PLANNING/ INDONESIA

Paper describes forecasting of energy for Pelita IV (1984/85 - 1988/89). Energy demand is projected by sector. Coal and geothermal sources will be utilized more particularly in electricity generation.
333.7917 Ene

7. Energy planning in developing countries

Dunkerley, Joy
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning
p.526-550
ENERGY PLANNING/ DEVELOPING COUNTRIES

Developing countries emphasize projections and strategies rather than implementation. Realistic assumptions and flexibility should be the basis in order to deal with uncertainties.
333.7917 EneU

8. Energy planning in the ASEAN countries

US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning
p.632-641
ENERGY PLANNING/ ASEAN

Final report on energy planning. Discusses present state of planning processes and implementation. Recommends need for better data, improved modelling and net pricing for purposes of energy conservation.
333.7917 EneU

9. The energy policy and energy development plan of Thailand in the 5th National Economic and Social Development Plan (1982-1986)

Kirtikara, K.
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning
p.1-11
ENERGY POLICY/ ENERGY PLANNING/ ENERGY MANAGEMENT/ THAILAND

Reviews energy demand and supply situations of Thailand during the last 20 years and domestic energy resources. The Energy Policy and Energy Development Plan in the 5th National Economic and Social Development Plan is discussed. Long term energy strategies are indicated.
333.7917 EneU

10. An exercise in energy planning and policy : Philippine case

Francisco, Gil T.
Asian Institute of Technology
Bangkok
1982
46p.
ENERGY POLICY/ PHILIPPINES

Reviews and comments "1981-86 National Energy Program" of the Philippines. Author discusses the possible energy scene and the corresponding alternative mixes of energy sources in the event that oil price either goes up or below as projected.
AIT S.S.P.R. no. ET-82-3

11. Good tidings under the tree

Jones, Evan
From: Petromin Asia
Dec 1982
p.18-28
PETROLEUM/ ENERGY POLICY/ MALAYSIA/ THAILAND/ INDONESIA

A detailed of review the 1982 energy situation in Asia is given. The result is that the region's energy industry is flourishing due to the energy policies followed by the government.

12. Indonesia's energy program

The Indonesian Delegation
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning
p.49-61 : tables
ENERGY POLICY/ RENEWABLE ENERGY SOURCES/ INDONESIA

Oil is primary source since Indonesia is an oil-exporting country. Efforts are underway to boost production and use of coal. Pilot projects and research are in biomass, ocean thermal, wind, geothermal and peat.
333.7917 EneU

13. The influence of the oil price on the long-term strategy in Japan : "scenario blue"

Ikuta, Toyoaki
From: OPEC review
6(2):133-139 : tables
Summer 1982
ENEPGY FORECASTS/ JAPAN

An examination of the 1985 and 1990 forecast of energy demand in Japan. The author, with the nelp of tables, discussed alternative energies to fuel, particularly the syntnetic fuels, but at the same time stressing the fact that dependence on oil will still persist.

14. Malaysia's energy program

Damasara, Wisma
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning
p.42-48
ENERGY POLICY/ ENERGY RESOURCES/ MALAYSIA

To diversify from heavy reliance on oil, Malaysia has a four fuel strategy based on gas, hydro, coal and oil. Priorities will be in hydro and natural gas. Solar and biomass are in the research stage.
333.7917 EneU

15. The new pacesetters : Japan, Korea, Taiwan

Curtis, Jerry L.
From: Resources Asia
Nov 1982
p.6-16
ENERGY POLICY/ ENERGY RESOURCES/ JAPAN/ KOREA R/ TAIWAN

A detailed article with energy statistics from Japan, Korea and Taiwan on how each dealt with the energy crisis. Japan has developed a strategy of "Energy Diplomacy" in other countries, Korea contracted to promote the mineral resources projects (32 in 11 countries) and Taiwan's CPC has conducted onshore and offshore surveys to locate energy resources.

16. Planning and programming of R & D projects on alternative energy development

US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)

ENERGY MANAGEMENT AND POLICY (CONT.)

From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning
p.551-564 : diag.
NON-CONVENTIONAL ENERGY SOURCE/ ENERGY PLANNING/ THAILAND

General survey of tasks involved in national energy planning - resource assessment, supply planning and pricing policy. Appendices diagram the energy system network for Thailand.
333.7917 EneU

17. Working paper of Thailand energy policy and planning 1981-1991

Thailand. National Energy Administration
Bangkok
1981
14p.
ENERGY POLICY/ ENERGY PLANNING/ THAILAND/ ASEAN

Working paper is describing energy planning and consumption in various economic sectors from 1981-1991. It shows details of sources and some co-operative projects in ASEAN.
333.7917 Thaw

ENERGY RESOURCES

18. Planning for small - scale use of renewable energy sources in Fiji

Johnston, P.
Expert Working Group Meeting on the Use of Solar and Wind Energy (1976 Mar 2 - 9 : Bangkok)
From: Proceedings of the meeting of the expert working group on the use of solar and wind energy
p.144-146
RENEWABLE ENERGY SOURCES/ ENERGY/ FIJI

Oil is main energy source. Development of wind and solar power is possible, so the latter is used in drying and water-heating.
333.7923 EcoP

ENERGY RESOURCES, ENERGY MANAGEMENT AND POLICY

19. Thailand's energy resources

From: Bangkok bank monthly review
23(8):308-324
Aug 1982
ENERGY RESOURCES/ THAILAND

Survey of Thailand's energy situation with up-to-date statistics on forecasts, consumption, non-renewable and renewable resources. The fifth Five-Year Plan 1982-1986 calls for reduction of oil imports from 75 percent to 46 percent by 1986. Article wants reliance on local resources and better planning of energy consumption.

RENEWABLE ENERGY SOURCES

20. US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning

Hertzmark, Donald I., edit.
Asian Institute of Technology. Renewable Energy Resources Information Center
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
Bangkok
1982
641p.
RENEWABLE ENERGY SOURCES/ ENERGY TECHNOLOGY/ ASEAN

Seminar is concerned with experiences and plans of ASEAN countries in new energy technology.
333.7917 EneU

Annex XIII

ศูนย์ข้อมูลพลังงานแห่งประเทศไทย

NEIC/BIB/1/3

พฤษภาคม 2526

พลังงานจากบทความวารสารภาษาไทย

2525

สำนักงานพลังงานแห่งชาติ
กองนโยบายและวางแผนพลังงาน
ศูนย์ข้อมูลพลังงานแห่งประเทศไทย
ถนนพระราม 1 กท. 10500
โทร. 221-0139

คำนำ

ศูนย์ข้อมูลพลังงานแห่งประเทศไทย เป็นหน่วยงานหนึ่งของสำนักงานพลังงานแห่งชาติ มีหน้าที่เป็นศูนย์รวบรวมและเผยแพร่ข่าวสารเกี่ยวกับการค้นคว้าวิจัย และพัฒนาเทคโนโลยีตลอดจนการใช้ประโยชน์จากพลังงาน ในหัวข้อต่อไปนี้คือ

Alternative sources of energy
- Coal
- Nuclear

Conservation of energy

Energy policy and management

Oil and natural gas

Renewable sources of energy
- Biomass
- Geothermal
- Hydropower
- Solar
- Wind

งานสำคัญอย่างหนึ่งของศูนย์ข้อมูลฯ คือ การจัดทำบรรณานุกรมในเรื่องต่าง ๆ ที่มีเนื้อหาเกี่ยวกับพลังงานสำหรับนักวิจัยและผู้สนใจทั่วไป บรรณานุกรมฉบับนี้เป็นฉบับที่ 3 ในชื่อว่า "พลังงานจากบทความวารสารภาษาไทย 2525" ศูนย์ข้อมูลฯ ได้เคยจัดทำบรรณานุกรมมาแล้ว 2 ฉบับ คือ "Energy in Thailand - Selected References" และ "Energy Serials (English and Thai)" ถ้าท่านสนใจบรรณานุกรมทั้ง 2 ฉบับดังกล่าวโปรดเขียนจดหมายขอไปยัง ศูนย์ข้อมูลพลังงานแห่งประเทศไทย

บรรณานุกรมฉบับนี้เรียงลำดับเนื้อหาตามตัวอักษรของหัวเรื่อง ภายใต้หัวเรื่องจะเรียงตามลำดับอักษรของชื่อผู้แต่งและในแต่ละหัวเรื่องจะมีคำภาษาอังกฤษกำกับเพื่อประโยชน์สำหรับฐานข้อมูลฯ ในอนาคต

เราหวังว่าบรรณานุกรมฉบับนี้คงเป็นประโยชน์ต่อท่าน ขอขอบคุณ

พลังงานจากบทความวารสารภาษาไทย

2525

ก๊าซชีวภาพ (BIOGAS)

ณรงค์ ณ เชียงใหม่. "การส่งเสริมการผลิตแก๊สชีวภาพในชนบท." วารสารสงขลานครินทร์ 4,3 (ก.ค.-ก.ย.25) : 231-234. ภาพประกอบ.

พิชิต สกุลพราหมณ์. "ก๊าซชีวภาพ พลังงานในยุคประหยัด." วารสารไทย 1,3 (ก.ค.-ก.ย.25) : 51-58. ภาพประกอบ.

ก๊าซธรรมชาติ (NATURAL GAS)

สละ ศิริไวทยพงศ์. "เรื่องของก๊าซธรรมชาติ." สาร ปตท. 6,4 (ก.ย.-ธ.ค.25) : 11-17.

สุรศักดิ์ ชิยางคบุตร. "ก๊าซธรรมชาติ." วิศวกรรม มข. 9,2 (เม.ย.-มิ.ย.25) : 75-77.

ก๊าซธรรมชาติ-ไทย (NATURAL GAS - THAILAND)

"ก๊าซธรรมชาติ : ควรจะส่งออกหรือไม่?" สรุปข่าวธุรกิจ 13,4 (16-28ก.พ.25) : 5-10 ตาราง.

"ก๊าซธรรมชาติ และ อุตสาหกรรมต่อเนื่อง ในโครงการพัฒนาชายฝั่งทะเลตะวันออก." วารสารเศรษฐกิจ ธนาคารกรุงเทพฯ จำกัด 14,11 (พ.ย.25) : 648-660. ภาพประกอบ.

"โครงการเกี่ยวเนื่องกับก๊าซธรรมชาติ." ข่าวสารการธรณี 27,5 (พ.ค.25) : 87-88.

ธนาคารไทยพาณิชย์ จำกัด. ฝ่ายวิจัยและวางแผน. "สถานการณ์พลังงานไทยในทศวรรษที่ 1980." ข่าวสารการธรณี 27,6 (มิ.ย.25) : 75-77.

"ปตท. ยืนยันอนาคตไทยมีก๊าซใช้ครบตามเป้า." ข่าวสารการธรณี 27,7 (ก.ค.25) : 93.

วิบูลย์ บุญบัณฑิต. "ยูเนียนออยล์ กับการสำรวจและพัฒนาแหล่งก๊าซธรรมชาติในอ่าวไทย" สารปตท. 6,4 (ก.ย.-ธ.ค.25) : 17-28.

"สถานการณ์ของการพบก๊าซธรรมชาติ และน้ำมันดิบในประเทศไทย." อุตสาหกรรมสาร 25,3 (มี.ค.25) : 15-19.

สละ ศิริไวทยพงศ์. "โครงการโรงงานแยกก๊าซธรรมชาติของการปิโตรเลียมแห่งประเทศไทย." ข่าวสารการธรณี 27,1-4 (ม.ค.-เม.ย.25) : 19-28.

ก๊าซธรรมชาติ-ออสเตรเลีย (NATURAL GAS - AUSTRALIA)

"โครงการก๊าซออสเตรเลียกำลังก่อรูปร่าง" (Major Australian Gas Project Takes Shape). ข่าวสารการธรณี 27,8 (ส.ค.25) :70.

ก๊าซธรรมชาติ-เอเชีย (NATURAL GAS - ASIA)

สละ ศิริไวทยพงศ์. "ก๊าซธรรมชาติพลังงานสำคัญของเอเชียในอนาคต." สารปตท. 6,4 (ก.ย.-ธ.ค.25) : 35-41. ตาราง.

ก๊าซธรรมชาติเหลว-ญี่ปุ่น (LIQUEFIED NATURAL GAS - JAPAN)

สละ ศิริไวทยพงศ์. "ญี่ปุ่นนำเข้า แอล เอ็น จี เพิ่มขึ้นเล็กน้อยในปี 2524." สารปตท. 6,4 (ก.ย.-ธ.ค.25) : 51-52. ตาราง.

ก๊าซธรรมชาติเหลว-ยุโรป (LIQUEFIED NATURAL GAS - EUROPE)

สละ ศิริไวทยพงศ์. "ก๊าซ LNG ในยุโรปตะวันตก." สารปตท. 6,3 (มิ.ย.-ส.ค.25) : 46-53. ตาราง.

ก๊าซธรรมชาติเหลว-อินโดนีเซีย (LIQUEFIED NATURAL GAS - INDONESIA)

สละ ศิริไวทยพงศ์. "โครงการผลิต แอล เอ็น จี ในอินโดนีเซีย." สารปตท. 6,4 (ก.ย.-ธ.ค.25) : 42-49.

ก๊าซหุงต้ม-เครื่องยนต์ (LIQUEFIED PETROLEUM GASES)

กองวิศวกรรมวิจัยและทดลอง. "การติดตั้งอุปกรณ์ และการใช้ก๊าซหุงต้มสำหรับเครื่องยนต์(เบนซิน)." สารปตท. 6,4 (ก.ย.-ธ.ค.25) : 55-68. ภาพประกอบ. ตาราง.

ขยะ-ก๊าซเชื้อเพลิง (REFUSE DERIVED FUELS)

สุทธิรักษ์ สุจริตตานนท์. "การผลิตก๊าซเชื้อเพลิงจากขยะ." จุลสารสภาวะแวดล้อม 1,4 (ส.ค.25) : 13-16. ภาพประกอบ.

เชื้อเพลิง (FUELS)

"เชื้อเพลิงธรรมชาติ." สารปตท. 6,3 (มิ.ย.-ส.ค.25) : 19-23.

เซลแสงอาทิตย์ (SOLAR CELLS)

ทรงเกียรติ. "เซลแสงอาทิตย์กับการผลิตไฟฟ้า." นิวเคลียร์สาร 7,46 (ก.ค.-ก.ย.25) : 23-31. ภาพประกอบ. ตาราง.

ประมวล วงศ์ภูงา. "การใช้เซลแสงอาทิตย์ กับระบบไฟกระพริบ." วิศวกรรมสาร 35,2 (เม.ย.25) : 89-92. ภาพประกอบ.

"แผงเซลแสงอาทิตย์." ข่าวสำนักงานคณะกรรมการวิจัยแห่งชาติ 23,246 (ธ.ค.25) : 5-6. ภาพประกอบ.

เซลแสงอาทิตย์-ไทย (SOLAR CELLS - THAILAND)

ประมวล. "เซลแสงอาทิตย์ที่สันกำแพง." นิวเคลียร์สาร 7,46 (ก.ค.-ก.ย.25) : 32-37. ภาพประกอบ.

น้ำขึ้นน้ำลง-โรงไฟฟ้า (TIDAL POWER PLANTS)

กลาป. "สิ่งที่จะต้องคิดกัน เมื่อมีปัญหาขาดแคลนน้ำมัน." ข่าวสารการธรณี 27,8 (ส.ค.25) : 4-24.

บ้านแสงอาทิตย์ (SOLAR HOUSES)

ปนัดดา. "บ้านพลังงานแสงอาทิตย์-บ้านแบบประหยัดในอนาคต." นิวเคลียร์สาร 7,47 (ต.ค.-ธ.ค.25) : 28-31. ภาพประกอบ.

ปิโตรเลียม (PETROLEUM)

ประคัลภ์ อุดมภักษร. "สรุปสถานะการณ์เกี่ยวกับการสำรวจและผลิตปิโตรเลียมในทะเลทั่วโลก." สารปตท. 6,4 (ก.ย.-ธ.ค.25) : 69-74. ตาราง.

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ปิโตรเลียม-ไทย (PETROLEUM - THAILAND)

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พลังงาน (ENERGY)

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พลังงาน-ไทย (ENERGY - THAILAND)

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สุจิตต์ สมศิริ. "ลูกหลานของขุนเขา." ข่าวการไฟฟ้า 26,214 (ม.ค.-ก.พ. 25) : 4-9, 48-51. ตาราง. ภาพประกอบ.

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พลังงานจากแสงอาทิตย์ (SOLAR ENERGY)

กรมวิทยาศาสตร์บริการ. กองสนเทศวิทยาศาสตร์และเทคโนโลยี. "เครื่องกลั่นน้ำด้วยพลังงานแสงแดด." อุตสาหกรรมสาร 25,1 (ม.ค.25) : 8-10. ภาพประกอบ.

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(NUCLEAR POWER PLANTS - CHINA)

ปนัดดา กงกะนันทน์, ผู้แปล. "โครงการโรงไฟฟ้านิวเคลียร์ของประเทศสาธารณรัฐประชาชนจีน." <u>นิวเคลียร์สาร</u> 7,45 (เม.ย.-มิ.ย.25) : 14-22. ภาพประกอบ.

พลังงานปรมาณู-โรงไฟฟ้า-ฝรั่งเศส

(NUCLEAR POWER PLANTS - FRANCE)

พรรณนิภา. "ฝรั่งเศสยังคงเป็นผู้นำทางด้านอุตสาหกรรมโรงไฟฟ้านิวเคลียร์." <u>นิวเคลียร์สาร</u> 7,46 (ก.ค.-ก.ย.25) : 20-22.

พลังงานไฟฟ้า-ไทย (ELECTRIC POWER - THAILAND)

"พลังงานไฟฟ้า." <u>ภาวะธุรกิจและอุตสาหกรรม</u> (เม.ย.25) ; 56-60. ตาราง.

"พลังงานไฟฟ้า." <u>ภาวะธุรกิจและอุตสาหกรรม</u> (ก.ค.25) : 42-46. ตาราง.

โรงไฟฟ้า-ไทย (ELECTRIC POWER PLANTS - THAILAND)

ธาตรี ริ้วเจริญ. "โรงไฟฟ้ากังหันก๊าซบางปะกง." <u>วารสารไทย</u> 2,5 (ม.ค.-มี.ค.25) : 37-40. ภาพประกอบ.

โรงไฟฟ้า-ญี่ปุ่น (ELECTRIC POWER PLANTS - JAPAN)

บอย, บางกระบือ. "โรงไฟฟ้าพลังโคลน." <u>ข่าวการไฟฟ้า</u> 26,215 (มี.ค.-เม.ย.25) : 23-41.

สบู่ดำ (JATROPHA CURCUS PLANT)

มนตรี ลิ้ม. "สบู่ดำ : ความหวังของพลังงานทดแทน." <u>สรุปข่าวธุรกิจ</u> 13,7 (1-15เม.ย.25) : 28-32.

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สิ่งแวดล้อม (ENVIRONMENT)

สุวพันธ์ นิสายน. "ผลกระทบต่อสิ่งแวดล้อมจากการระบายความร้อนของโรงไฟฟ้านิวเคลียร์สาร." <u>นิวเคลียร์สาร</u> 7,47 (ต.ค.-ธ.ค.25) : 17-27. ภาพประกอบ.

หินน้ำมัน (OIL SHALES)

Sunt Rachdawong. "The oil shale development project and investment policy." <u>ข่าวสารการธรณี</u> 27,1-4 (ม.ค.-เม.ย.25) : บทความภาษาอังกฤษ.

แหล่งพลังงาน-ไทย (ENERGY SOURCES - THAILAND)

"ปัจจุบันและอนาคตของแหล่งพลังงานไทย." <u>วารสารเศรษฐกิจธนาคารกรุงเทพฯ จำกัด</u> 14,8 (ส.ค.25) : 430-443. ภาพประกอบ.

แอลกอฮอล์-เชื้อเพลิง-ไทย (ALCOHOL FUELS - THAILAND)

จำรูญ มาลัยกรอง. "การใช้เชื้อเพลิงแอลกอฮอล์ทำให้รัฐเสียรายได้จริงหรือ." <u>อุตสาหกรรมสาร</u> 25,2 (ก.พ.25) : 9-17. ตาราง.

แอลกอฮอล์-เชื้อเพลิง-ฟิลิปปินส์ (ALCOHOL FUELS - PHILIPPINES)

เอกไทย วงศ์สวัสดิ์กุล. "แอลกอฮอล์เพื่อใช้เป็นเชื้อเพลิงในประเทศฟิลิปปินส์." <u>อุตสาหกรรมสาร</u> 25,2 (ก.พ.25) : 18-25. ตาราง. ภาพประกอบ.

Annex XIV

NATIONAL ENERGY INFORMATION CENTER
ENERGY POLICY AND PLANNING DIVISION
NATIONAL ENERGY ADMINISTRATION
MINISTRY OF
SCIENCE, TECHNOLOGY AND ENERGY
BANGKOK, THAILAND

DIRECTORY OF ENERGY RESEARCH AND INFORMATION CENTERS IN THAILAND AND THE ASEAN JUNE 1984

ADDRESS: NATIONAL ENERGY INFORMATION CENTER
NATIONAL ENERGY ADMINISTRATION
RAMA 1 ROAD, BANGKOK 10500
THAILAND

THIS DIRECTORY WAS PREPARED BY PROJECT PERSONNEL-SAMIRA MEGHDESSIAN, PIYANART SANGUANMANEE, CHULAMANEE KAEWKANGWAL AND KORNTHIKAR CHULLABRAHM (UNDER USAID PROJECT NO. 493-0903)

INTRODUCTION

The National Energy Information Center (NEIC) is a department at the National Energy Administration of the Ministry of Science, Technology and Energy.

One of the basic functions of the NEIC in its role as an energy information referral center is to lead researchers to the sources of energy research and technology. Since its inception, the NEIC began accumulating the names of these centers, until it was decided to organize this collection in a directory.

But while this directory was being prepared, several others of its kind appeared on the market, with an international scope. One may wonder as to the purpose behind producing yet another directory on energy. The answer is simple - within Thailand and the ASEAN, no such source existed. Perhaps in this aspect, we can call this directory a novel one - in that it links users in Thailand and ASEAN with respective energy research centers, thus attempting to facilitate communication and opening new venues of cooperation in the exchange of energy information, whose crucial importance today no one can dispute.

THE QUESTIONNAIRE

More than 100 centers that are energy-related were identified. A simple questionnaire, whose main purpose was to emphasize topics of energy research and the provision of information, was circulated in August 1983. By December 1983, the following were received.

From Thailand	38
From Indonesia	13
From Malaysia	5
From The Philippines	22
From Singapore	6
Total	84

For each center, the following details were requested

- Full name and acronym
- Objectives and purpose of the center
- Address
- Person to contact
- Type of center
- Subject coverage
- Publications
- Services
- User restrictions

ARRANGEMENT

With Thailand preceding the list, countries of ASEAN (with the exception of Brunei) are arranged alphabetically, followed by a section titled "Regional Organizations". Within each country, centers are arranged alphabetically as well. Centers which are part of larger organizations, will be located under the parent organization. The index, however, tabulates them all, with page references, regardless of where they belong.

A

A topical index will indicate in which centers, research is carried out. Centers for which no questionnaires were received, and for which the necessary information was located through other sources, will have an asterisk (*) against their name. The following titles supplied the needed information:

- Business International Asia/Pacific. *Energy outlook for Asia.* Hong Kong, 1981
- Cambridge Information and Research Services, comp. *World directory of energy information.* Vol.2 : Middle East, Africa and Asia/Pacific. London: Gower, 1982.
- United Nations Educational, Scientific and Culturer Organization (UNESCO) and the Solar Energy Research Institute (SERI). *Information directory of new and renewable energy information sources and research centres.* Colorado: A.B. Hirschfeld Press, 1982.

ACKNOWLEDGEMENTS

The National Energy Information center (NEIC) wishes to acknowledge with gratitude the financial assistance provided by the United States Agency for International Development, under the Project No. 493 - 0304 (Renewable and Non - conventional Energy Project, Bangkok, Thailand 1980 - 1984), which made the issuance of this directory possible.

(Example of Directory Content)

1. CHIANGMAI UNIVERSITY CENTRAL LIBRARY

130 Huy Kaew Road
Chiangmai 50002
Tel. no. 221699 ext. 151, 152 ; 221254

CONTACT

Director of the Library

OBJECTIVES

The library supports the educational programme of the University. On the national level, it also applies the educational objectives outlined in the Fifth Five - Year Plan.

TYPE OF CENTER

Government organization / Library (traditional) / National

SUBJECT COVERAGE

Appropriate technology / Biomass/Biogas / Coal / Draught Animal Power / Energy conservation / Energy planning / Geothermal energy / Hydro power / Nuclear energy / Petroleum / Solar energy / Wind energy

PUBLICATIONS

Bibliographies
- Bibliography on Highlands Research in Northern Thailand
- Bibliography on Rural Community Development Research in Northern Thailand

Others
- Directory of Chiangmai University Faculty Members' Research
- List of New Titles

SERVICES

Library loans
Reference services
Photocopying
Bibliography compiling

USER RESTRICTIONS

Yes

Annex XV

N E I C MAILING LIST

INTERNATIONAL

1. Appropriate Technology Development Organization
   1-B 47th Street, F-7/1
   Islamabad, Pakistan

2. ASEAN Secretariat
   70-A Jalan Sisingamangaraja
   Jakarta, Indonesia

   Mailing Address:
   P.O. Box 2072
   Jakarta, Indonesia

   Attn: Mr. C. P. F. Luhulima
   Director of Science and Technology

3. Asian and Pacific Development Center
   Pesiaran Data
   P.O. Box 2224
   Kuala Lumpur, Malaysia

   Attn: A. How, Librarian

4. Asian Data Serivce
   Data Library
   Data Resources Inc.
   Suite 1060
   1750 K. Street N.W.
   Washington D.C. 20006
   USA

   Attn: Ms. Sally Baldwin

5. Asian Development Bank
   2330 Roxas Blvd.
   Metro Manila
   P.O. Box 789
   Manila, Philippines 2800

   Attn: Library & Project Division

6. Asian Recycling Association
   P.O. Box 753 Bacolod City
   Negros Occidental
   Philippines

7. Australian Department of Trade and Resources
   Canberra ACT 2600
   Australia

8. Australian Information Service
   P.O. Box 12
   Canberra, ACT 2600
   Australia

9. Australian Institute of Energy
   P.O. Box 230
   Wahroonga, New South Wales 2076
   Australia

10. Australian Institute of Petroleum Ltd.,
    227 Collins ST.
    Melbourne, Victoria 3000
    Australia

11. Barangay Technology Center
    Philippine Women's University
    Taft Avenue
    Manila, Philippines

12. Mr. B. Bergstein
    82 Bon Aire Circle
    Suffern, New York 10901
    USA

13. Bio-Energy Council
    1625 Eye Street N.W.
    Suite 825A
    Washington D.C. 20006
    USA

14. Board for Science and Technology for International Development (BOSTID)
    National Research Council
    2101 Constitution Ave., N.W.
    Washington D.C. 20418
    USA

15. British Institute of Energy Economics
    9 St. James Square
    London SW1Y 4LE
    UK

16. The British Petroleum Co., Ltd.
    Library
    Britannic House
    Moor Lane
    London EC 2Y 9BU
    England

17. Brookhaven National Laboratory
    Solar Technology Group Building 701
    Upton, New York 11973 USA

    Attn: Mr. W.G. Wilhelm

18. Center for Non-conventional Energy Development (CNED)
    Ministry of Energy
    Don Mariano, Marcus Ave.
    Diliman, Quezon City
    Philippines

19. Library
    Central Bank of the Philippines
    Manila, Philippines

20. Central Bureau of Statistics
    8 Jalan Dokter Sutomo
    P.O. Box 3, Jakarta
    Indonesia

21. Ceylon Institute of Scientific and Industrial Research
    363 Banddalokha Mawatha
    P.O. Box 787
    Colombo 7, Sri Lanka

22. CIGRE
112 Boulevard Haussmann
75008 Paris
France

23. Claudine Brelet (Mme)
Editor, ATH Newsletter
World Health Organization
1211 Geneva 27
Switzerland

24. Clean Energy Research Institute
University of Miami
P.O. Box 248294
Coral Gables, Florida 33124
USA

25. Committee in Science and Technology in Development Countries (COSTED)
Indian Institute of Science
Bangalore 560012
India

26. CRRERIS
Chief Librarian
314 Albert Street
East Melbourne
Victoria, Australia 3002

27. CSIRO
Chief Librarian
314 Albert Street
East Melbourne
Victoria, Australia 3002

28. Department of Energy
National Energy Information Center
EI-20
Forrestal Building
Washington, D.C. 20585
USA

29. Department of Energy
Thames House South
Millbank, London SW1P 4QJ
England

Attn: Library

30. Department of Resources and Energy
G.P.O. Box 858
Canberra ACT 2601
Australia

31. Department of Scientific and Industrial Research
Private Bag
Wellington, New Zealand

32. Develop Information Service
Denver Research Institute
University of Denver
University Park, Denver
Colorado 80208
USA

33. Director General
Directorate of Energy
Jalan Merdeka Selatan 18
Jakarta, Indonesia

34. East-West Center
1777 East-West Road
Honolulu, Hawaii 96848
USA

35. Electric Power Research Institute (EPRI)
P.O. Box 10412, Palo Alto
California 94303
USA

36. ENERCON Council
Philippine National Oil Company
Rm. 1106
PNOC Bldg.
Makati Ave
Metro Manila
Philippines

37. Energy Research and Development Council
Don Mariano Marcus Ave.
Diliman, Quezon City
Philippines

Attn: Dr. Ibarra Cruz

38. Energy Resources Conservation Board
640 Fifth Avenue SW, Calgary
Alberta, Canada T2P3G4

39. ESCAP Regional Mineral Resources
Development Center (RMRDC)
Jalan Jenderal Sudirman 623
Bandung, Indonesia

40. German Appropriate Technology Exchange
German Agench for Technical Cooperation
Daj Hammarskjold-Weg 1
6236 Eschborn 1
West Germany

41. Hawaii National Energy Institute
University of Hawaii at Manoa
2540 Dole Street, Holmes Hall 246
Honolulu, Hawaii 96822

42. IEA Coal Research
14/15 Lower Grosvenor Place
London SW1 OEX
U.K.

43. IEA/OECD, Library
Chateau de la Muette
2 Rue Andre Pascal
75775 Paris Cedex 16
France

44. Institute of Developing Economics, Library
42 Ichigaya Hommura-cho
Shinjuku-ku, Tokyo 162
Japan

45. Institute of Energy Economics
No. 10 Mori Bldg.
1-18-1 Toranomon
Mimito-ku, Tokyo 105
Japan

46. International Atomic Energy Agency (IAEA)
P.O. Box 100
A-1400 Vienna
Austria
(Library)

47. International Development Research Center (IDRC)
Asia Regional Office
Tanglin
P.O. Box 101
Singapore 9124

48. International Recycling Group of Companies
Rossi-Nayve Consultancy Services Inc.
P.O. Box 753
Bacolod City
Philippines

49. Johahn Wolfgang Geothe Universitaet
Mertonstrasse 17/21
6000 Frankfurt am Main 1
Federal Republic of Germany

Attn: Prof. Gehrig

50. Kentucky Center for Energy Research
Box 11888
Iron Wroks Pike
Lexington, Kentucky 40511
USA

51. Korea Development Institute
207-41 Cheongryangri-dong
Dongdaemun-ku
P.O. Box 113, Seoul
Korea

52. KORSTIC(Korea Scientific and Technological Information Center)
Dept. of Information Resources
Box 1229
Seoul, Korea

53. Kuwait Institute for Scientific Research
P.O. Box 24885
Safat, Kuwait
(Library)

54. Manila Electric Company
P.O. Box 451
Manila, Philippines 12103

55. Ms. Mary Jane Ruhl
Information Management Inc.
905 Enderby Drive
Alexandria, Virginia 22302
USA

56. Energy Laboratory (e-lab)
Massachusetts Institute of Technology
Room E40-495
Cambridge, Massachusetts 02139
USA

57. Ministry of Energy
Private Bag
Wellington,
New Zealand

58. Ministry of Energy, Telecommunications and Posts
Wisna Damansara
Jalan Semantan
Kuala Lumpur, Malaysia

Attn: Mr. Nawawi bin Mohammad
Deputy Sec. General

59. Ministry of International Trade and Industry (MITI)
3-1, Kasumigaseki 1-chome,
Chiyoda-ku, Tokyo
Japan

60. National Electricity Board of the States of Malaya
129 Jalan Bangsar
P.O. Box 1003
Kuala Lumpur, Malaysia

61. National Library of Australia
Canberra, ACT 2600
Australia

62. National Library of Singapore
Stamford Road 0617
Singapore

63. National Science Development Board
Bieutan, Taguing, Metro Manila
P.O. Box 3569
Manila, Philippines

64. New Zealand Energy Research and Development Committee
University of Auckland
Private Bag, Auckland
New Zealand

65. Energy R & D
Oak Ridge National Laboratory
Building 3603
P.O. Box X
Oak Ridge, Tenn. 37830
USA

66. Energy Research Group
The Open University
Walton Hall
Milton Keynes, MK7 6AA
U.K.

Attn: Mrs. I.B. Bellis

67. Pakistan Council of Scientific and
Industrial Research
Directorate of Industrial
Liaison
39 Garden Road, Karachi 0310
Pakistan

68. PERTAMINA
3-4-6 Jalan Perwira
Jakarta, Indonesia

Attn: Library

69. PETONAS
Bangunan Petronas
36 Jalan Pudu
P.O. Box 2444
Kuala Lumpur, Malaysia

70. Philippine Center for Appropriate
Technology and Training
1416 F. Agoncillo St.
Ermita, Metro Manila
Philippines

71. Power Research Institute
Scientific Services Divison
P.O. Box 1/KBT Kebayoran
Jakarta, Indonesia

72. Public Utilities Board of Singapore
Pub. Bldg. Somerset Rd.
Singapore 0923

73. Regional Center for Energy, Heat and Mass
Transfer for Asia and The Pacific
Dept. of Mechanical Engineering
Indian Institute of Technology
Madras 600036, India

74. Regional Center for Technology
Transfer (RCTT)
Bangalore 560052
India

75. Regional Development Research Institute
Korea Institute of Science and Technology
39-1 Hawolgok Dong Sungbuku-ku
Seoul, Korea

76. Regional Mineral Resources Development
Center (RMRDC)
see
ESCAP Regional Mineral Resources
Development Centre (RMRDC)

77. Regional Office for Science and
Technology for Southeast Asia
UNESCO-UN Bldg.
Jalan M-H, Thamrin 14
Jakarta-Pusat
Indonesia

Attn: Mr. U.S. Kuruppu

78. Rice University Energy Research and
Education Foundation
Rm. B49 Fondren Library
P.O. Box 1892
Houston, Texas 77001
USA

79. Science Centre Board
Science Centre Bldg.
Seicnce Centre Road 2260
Singapore

80. Shell Centre
London S.E.1 7NA
U.K.

Attn: Library

81. Solar Energy Research Institute
Golden, Colorado 10412
USA

82. Solar Energy Research Institute
39-1 Hawolgok-Dong
Sungbuk-ku, Seoul
Korea

83. Southern Illinois University at Carbondale
Coal Extraction and Utilization Center
Carbondale, Illinois 62901
USA

84. TATA Energy Research Institute
Bombay House
24 Homi Mody Street
Bombay 400023
India

Attn: Information Center

85. TECHNONET ASIA
Tanglin P.O. Box 160
Singapore 9124

86. Energy Information Section
UNESCO
7 Place de Fontenoy
75700 Paris
France

Attn: Mr. C.M. Gottshchalk, Chief

87. U.N. Conference on New and Renewable
Sources of Energy-Secretariat
Rm. DC-818 United Nations
New York, NY 10017
USA

88. United Nations University
Toho Seimei Building
15-1 Shibuya-ku
Tokyo 150, Japan

Attn: Development Studies Division

89. University of California Energy Center
Dept. of Applied Mechanics and
Engineering Sciences B-010
P.O. Box 109
La Jolla, California 92093
USA

90. University of Pennsylvania
Energy Center Towne Bldg.
220 South 33rd Street
Philadelphia, PA 19174
USA

91. University of Rochester
Energy Research and Development Project
601 Elmwood Ave.
Rochester, NY 14642
USA

92. University of Wyoming
Natural Resources Research Institute
Box 3038, University Station
Laramie, Wyoming 82071
USA

93. Volunteers in Technical Assistance (VITA)
3706 Rhode Island Ave.
Mt. Rainier, Maryland 20822
USA

94. West Virginia University
Coal Research Bureau
Morgantown, West Virginia 26506
USA

95. World Bank
1818 H. Street N.W.
Washington D.C. 20433
USA

THAILAND

96. Gifts and Exchanges
Library of Congress Office
American Embassy
Wireless Road
Bangkok

97. Asian Institute of Technology
Asian Information Center for Geotechical
Engineering
P.O. Box 2754
Bangkok

98. Asian Institute of Technology
Energy Technology Division
P.O. Box 2754
Bangkok

99. Asian Institute of Technology
Library and Regional Documentation Center
P.O. Box 2754
Bangkok

100. Asian Institute of Technology
RERIC
P.O. Box 2754
Bangkok

101. Economic and Social Commission for Asia
and the Pacific
Library
Rajadamnern Ave.
Bangkok 10200

102 Economic and Social Commission for Asia
and the Pacific
Rural Energy Division
Rajadamnern Ave.
Bangkok 10200

103. ESSO Standard Thailand Limited
1016 Rama 4
Bangkok 10500

Attn: Mr. Pipop Pruechsamars
Public Affairs Manager

104. Jetro
159 Ratchadamri Road
Bangkok

105. JICA
สถานทูตญี่ปุ่น

๑๖๗๔ ถนนเพชรบุรีตัดใหม่

กทม

106. Mr. John Hanson (EEC)

อาคารทหารไทย ชั้น ๙

๓๔ ถ. พญาไท

กท ๑๐๔๐๐

107. Mobil Oil Thailand Ltd.
3rd floor, USOM Bldg.
37 Soi Somprasong 3
Petchburi Road
Bangkok 10310

Attn: Khun Aiyara Kunjara
Director

108. Thai Oil Refinery Co., Ltd.
Sarasin Bldg., 6th Floor
14 Surasak Road
Bangkok 10500

109. เจ้ากรมการพลังงานทหาร

ถนนเพชรบุรี

กทม ๑๐๔๐๐

110. อธิบดี

กรมประชาสัมพันธ์

ถ. ราชดำเนิน

กทม ๑๐๒๐๐

111. กรมป่าไม้

ห้องสมุด

61 ถนนพหลโยธิน

กทม. 10900

112. ดร. อรุณ ชมชาญ

กรมป่าไม้

ถ. พหลโยธิน

กท. 10900

113. คุณบุญส่ง ธรรมศิริ

กองจัดการที่ดินป่าสงวนแห่งชาติ

กรมป่าไม้ ถ. พหลโยธิน

กรุงเทพ 10900

114. ห้องสมุดกรมวิทยาศาสตร์บริการ

ถนนพระราม 6

กทม. 10400

115. อธิบดี

กรมวิเทศสหการ

ถนนกรุงเกษม

กทม. 10100

116. อธิบดี

กรมเศรษฐกิจ

กระทรวงการต่างประเทศ

วังสราญรมย์

กทม. 10200

117. ปลัดกระทรวงวิทยาศาสตร์เทคโนโลยีและการพลังงาน

ถนนพระราม 6

กทม. 10400

118. ผู้อำนวยการกองวิชาการและวิเทศสัมพันธ์

กองวิชาการและวิเทศสัมพันธ์

สำนักงานปลัดกระทรวง

กระทรวงวิทยาศาสตร์เทคโนโลยีและการพลังงาน

ถนนโยธี

กทม. 10400

โทร. 281-7244 ต่อ 83

119. สำนักนโยบายและแผนวิทยาการเทคโนโลยีและการพลังงาน

กระทรวงวิทยาศาสตร์เทคโนโลยีและการพลังงาน

ถ. พระราม 6

กทม. 10400

120. บรรณารักษ์

ห้องสมุดกรมทรัพยากรธรณี

กระทรวงอุตสาหกรรม

ถนนพระราม 6

กรุงเทพ 10400

121. คุณประสิทธิ์ สุวรรณประทีป

กองเศรษฐกิจและเผยแพร่

กรมทรัพยากรธรณี

ถ. พระราม 6

กท. 10400

122. ร.อ. หญิงสาลี แสงมิตร

กองการศึกษาและวิจัย

กรมอุตุนิยมวิทยา

ถนนสุขุมวิท - บางกะปิ

กรุงเทพ 10240

123. การปิโตรเลียมแห่งประเทศไทย

14 ซอยยาสูบ

ถนนวิภาวดีรังสิต

กทม. 10900

124. คุณสละ ศิริไวทยพงศ์

การปิโตรเลียมแห่งประเทศไทย

ถ. วิภาวดีรังสิต

กรุงเทพ 10900

125. การไฟฟ้านครหลวง

121 ถนนจักรเพชร

กทม. 10200

126. การไฟฟ้าส่วนภูมิภาค

200 ถนนงามวงศ์วาน

บางเขน กทม. 10900

127. การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย
ห้องสมุด
53 ถนนจรัญสนิทวงศ์
เชิงสะพานพระราม 7
บางกรวย นนทบุรี
กทม. 11130

128. ผู้อำนวยการกองประชาสัมพันธ์
การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย
53 ถ. จรัญสนิทวงศ์
บางกรวย นนทบุรี 11130

129. แผนกสนเทศบริการ
กองสารนิเทศ ฝ่ายประชานิเทศ
การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย
บางกรวย
นนทบุรี 11130

130. ผู้อำนวยการกองพลังงานพิเศษ
การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย
53 ถ. จรัญสนิทวงศ์ บางกรวย
นนทบุรี 11130

131. ผู้ว่าการ
การนิคมอุตสาหกรรมแห่งประเทศไทย
ซอยกล้วยน้ำไท ถนนพระราม 4
กรุงเทพ 10110

132. ห้องสมุดคณะวิทยาศาสตร์
จุฬาลงกรณ์มหาวิทยาลัย
พญาไท กทม. 10500

133. ภัทรภูรี จงเฟื่องปริญญา
บรรณารักษ์
ห้องสมุดคณะวิศวกรรมศาสตร์
จุฬาลงกรณ์มหาวิทยาลัย
ถ. พญาไท กทม. 10500
โทร 252-5001 ต่อ 130

134. ดร. วรพัฒน์ อรรถยุกติ
ภาควิชาวิศวกรรมเคมี
คณะวิศวกรรมศาสตร์
จุฬาลงกรณ์มหาวิทยาลัย
กรุงเทพ 10500

135. อ. ขนิษฐ์ ศัลหวิรัตน์
ผู้อำนวยการสถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย
พญาไท กทม. 10500

136. ศูนย์เอกสารประเทศไทย
สถาบันวิทยบริการ จุฬาลงกรณ์มหาวิทยาลัย
พญาไท
กทม. 10500

137. คุณอมรรัตน์ รัตนธาดา
บริษัทเชลล์แห่งประเทศไทย
140 ถ. วิทยุ
กท 10500

138. ห้องสมุดธนาคารกรุงเทพ
9 ถนนเสือป่า
ตู้ป.ณ. 95
กทม

139. ธนาคารเชสแมนฮัตตัน
ห้องสมุด
965 ถนนพระราม 1
สยามเซ็นเตอร์
กทม 10500

140. ฝ่ายวิจัยและวางแผน (ห้องสมุด)
ธนาคารไทยพาณิชย์ จำกัด (สำนักงานใหญ่)
1060 ถนนเพชรบุรี
กรุงเทพ 10400

141. ธนาคารโลก
ตึกอุดมวิทยา ชั้น 5
956 ถนนพระราม 4
ศาลาแดง กทม. 10500

142. ฝ่ายวิชาการ
ธนาคารแห่งประเทศไทย
บางขุนพรหม
กรุงเทพ ฯ 10200

143. ห้องสมุดและศูนย์สารนิเทศ
ธนาคารแห่งประเทศไทย
บางขุนพรหม กท. 10200

144. ธีระชัย ไพศรุ่งเรืองสกุล
103 หมู่ 1 ถ. ประชาอุทิศ
ต. บางมด เขตราษฎร์บูรณะ
กรุงเทพ 10140

145. ศูนย์เอกสารทางวิชาการฝ่ายเทคนิค
บริษัท ปูนซีเมนต์ไทย จำกัด
ป. ณ. อ. 55 บางซื่อ
กทม. 10800

146. หัวหน้าภาควิชาสัตวบาล คณะเกษตร
มหาวิทยาลัยเกษตรศาสตร์
บางเขน กรุงเทพ ฯ 10900

147. บรรณารักษ์หอสมุดกลาง
มหาวิทยาลัยเกษตรศาสตร์
บางเขน กรุงเทพ ฯ 10900

148. คณบดี คณะวิศวกรรมศาสตร์
มหาวิทยาลัยขอนแก่น
อ. เมือง
ขอนแก่น 40002

149. หอสมุดกลาง
ห้องสมุดมหาวิทยาลัยขอนแก่น
อ. เมือง
จ. ขอนแก่น 40002

150. บรรณารักษ์
หอสมุดกลาง มหาวิทยาลัยเชียงใหม่
เชียงใหม่ 50000

151. ห้องสมุดคณะเศรษฐศาสตร์
มหาวิทยาลัยธรรมศาสตร์
กทม. 10200

152. วิภาวรรณ บุญปิจ
ห้องสมุดสตางค์ มงคลสุข
คณะวิทยาศาสตร์ มหาวิทยาลัยมหิดล
ถนนพระราม 6 กท. 10400
โทร. 282 2845

153. ห้องสมุดมหาวิทยาลัยศรีนครินทรวิโรฒบางแสน
บางแสน
ชลบุรี
20130

154. ห้องสมุดกลางมหาวิทยาลัยศรีนครินทรวิโรฒปทุมวัน
ถนนอังรีดูนังต์
กทม. 10500

155. หอสมุดกลางมหาวิทยาลัยศรีนครินทรวิโรฒประสานมิตร
ซอยประสานมิตร
กทม. 10110

156. บรรณารักษ์ฝ่ายวารสาร
สำนักหอสมุดกลาง
มหาวิทยาลัยศรีนครินทรวิโรฒมหาสารคาม
มหาสารคาม

157. หอสมุดกลางมหาวิทยาลัยสงขลานครินทร์หาดใหญ่
อ. หาดใหญ่
จ. สงขลา 90110

158. คณบดี คณะวิศวกรรมศาสตร์
มหาวิทยาลัยสงขลานครินทร์ หาดใหญ่
อ. หาดใหญ่
จ. สงขลา 90110

159. ดร. นักสิทธิ์ คูวัฒนชัย
คณะวิศวกรรมศาสตร์
มหาวิทยาลัยสงขลานครินทร์
หาดใหญ่ สงขลา 90110

160. บรรณาธิการวารสารสงขลานครินทร

กองบริการการศึกษา

สำนักงานอธิการบดี วิทยาเขตหาดใหญ่

มหาวิทยาลัยสงขลานครินทร

ตู้ปณ ๑ คอหงส์ หาดใหญ่

สงขลา ๙๐๑๑๒

161. ศูนย์บรรณสารสนเทศ

มหาวิทยาลัยสุโขทัยธรรมาธิราช

๓๒๘ ถ. ศรีอยุธยา

พญาไท กท. ๑๐๔๐๐

162. คุณบินทร์ ศิลารัชนาบัย

องค์การยูเสด

๒๐๔๘ ซอยสมประสงค์ ๓

ถนนเพชรบุรี

กทม ๑๐๓๑๐

163. อ.เกษร เต้าสิริ

โรงเรียนช่างอากาศบำรุง

ถ. เทชะวณิช

แขวงถนนนครไชยศรี

เขตดุสิต

กทม. ๑๐๓๐๐

164. ห้องสมุดวิทยาลัยครูจันทรเกษม

วิทยาลัยครูจันทรเกษม

ลาดพร้าว

กทม. ๑๐๒๓๐

165. ห้องสมุดวิทยาลัยครูบ้านสมเด็จ

วิทยาลัยครูบ้านสมเด็จ

ถนนอิสรภาพ

กทม. ๑๐๖๐๐

166. ห้องสมุดวิทยาลัยครูสวนสุนันทา

วิทยาลัยครูสวนสุนันทา

เขตดุสิต

กทม. ๑๐๓๐๐

167. ห้องสมุดกลางวิทยาลัยป้องกันราชอาณาจักร

วิทยาลัยป้องกันราชอาณาจักร

บางเขน

กท. ๑๐๙๐๐

168. ศูนย์พัฒนาและเผยแพร่ ฯ

ตู้ ป.ณ. ๒๒ อ.เมือง

จ. พิษณุโลก ๖๕๐๐๐

169. ผู้บัญชาการศูนย์วิจัยและพัฒนาการทหาร

ซอยกล้วยน้ำไท ถนนพระราม ๔

พระโขนง กท. ๑๐๑๑๐

170. สมาคมส่งเสริมเทคโนโลยี (ไทย-ญี่ปุ่น)

ห้องสมุด

๕-๗ สุขุมวิท ซอย ๒๙

พระโขนง

กรุงเทพ ฯ ๑๐๑๑๐

171. สถานทูตนิวซีแลนด์

ฝ่ายวัฒนธรรม

๙๓ ถนนวิทยุ

กทม. ๑๐๕๐๐

172. สถานทูตออสเตรเลีย

ห้องสมุด

๓๗ สาธรใต้

กทม. ๑๐๑๒๐

173. อธิการบดี

สถาบันเทคโนโลยีการเกษตรแม่โจ้

อ. สันทราย

เชียงใหม่ ๕๐๒๑๐

174. คุณเอมอร ศรีนิลทา

ห้องสมุดสถาบันเทคโนโลยีพระจอมเกล้า ธนบุรี

๙๑ สุขสวัสดิ์ ๔๘

บางมด ราษฎร์บูรณะ

กทม. ๑๐๑๔๐

175. ดร. ปรีดา วิบูลย์สวัสดิ์
คณะพลังงานและวัสดุ
สถาบันเทคโนโลยีพระจอมเกล้า ธนบุรี
๙๑ สุขสวัสดิ์ ๔๘
บางมด ราษร์บูรณะ
กท. ๑๐๑๔๐

176. ดร. กฤษณพงศ์ กีรติกร
คณบดีคณะวิศวกรรมศาตร์
สถาบันเทคโนโลยีพระจอมเกล้า ธนบุรี
๙๑ สุขสวัสดิ์ ๔๘
บางมด ราษฎร์บูรณะ
กทม. ๑๐๑๔๐

177. ดร. หริศ สูตะบุตร
คณะวิศวกรรมศาสตร์
สถาบันเทคโนโลยีพระจอมเกล้า ธนบุรี
๙๑ สุขสวัสดิ์ ๔๘
บางมด ราษฎร์บูรณะ
กทม. ๑๐๑๔๐

178. คุณวรศิริ ธรรมประดิษฐ์
บรรณารักษ์ห้องสมุดคณะวิศวกรรมศาสตร์
สถาบันเทคโนโลยีพระจอมเกล้า ลาดกระบัง
หัวตะเข้
กทม. ๑๐๕๒๐

179. สำนักบรรณสารการพัฒนา
สถาบันบัณฑิตพัฒนบริหารศาสตร์
ถนน คลองตัน-หัวหมาก
กท. ๑๐๒๔๐

180. ผศ.ดร. อนุชา จินตนานนท์
คณะพัฒนาการเศรษฐกิจ
สถาบันบัณฑิตพัฒนบริหารศาสตร์
คลองจั่น
กรุงเทพฯ ๑๐๒๔๐

181. คุณนารา พิทักษ์วรรณพ
ผู้อำนวยการโครงการวิจัยพลังงาน
สถาบันวิจัยวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย
๑๙๖ พหลโยธิน บางเขน
กทม ๑๐๙๐๐

182. ศูนย์บริการเอกสารการวิจัยแห่งประเทศไทย
สถาบันวิจัยวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย
๑๙๖ ถนนพหลโยธิน
กทม ๑๐๙๐๐

183. ห้องสมุดสถาบันส่งเสริมการสอนวิทยาศาสตร์และเทคโนโลยี
๙๒๔ ถนนสุขุมวิท
หลังท้องฟ้าจำลอง
กทม ๑๐๑๑๐

184. โครงการเทคโนโลยีที่เหมาะสม
สถาบันส่งเสริมการสอนวิทยาศาสตร์และเทคโนโลยี
๙๒๔ ถ. สุขุมวิท หลังท้องฟ้าจำลอง
กรุงเทพฯ ๑๐๑๑๐

185. คุณจิตรา เดชะเสน
กองประเมินผลและรายงาน
สำนักงบประมาณ
ทำเนียบรัฐบาล
กทม. ๑๐๓๐๐

186. เลขาธิการ
สำนักงานคณะกรรมการข้าราชการพลเรือน
ถนนพิษณุโลก
กทม. ๑๐๓๐๐

187. เลขาธิการ
สำนักงานคณะกรรมการการศึกษาแห่งชาติ
ถ. สุโขทัย
กทม. ๑๐๓๐๐

188. ห้องสมุด
สำนักงานคณะกรรมการการศึกษาแห่งชาติ
ถนน สุโขทัย
กทม. ๑๐๓๐๐

189. สำนักงานคณะกรรมการพัฒนาการเศรษฐกิจและสังคมแห่งชาติ

ถ. กรุงเกษม เขตป้อมปราบ

กรุงเทพ 10100

190. ฝ่ายวางแผนพลังงาน

กองโครงการพื้นฐานเศรษฐกิจ

สำนักงานคณะกรรมการพัฒนาการเศรษฐกิจและสังคมแห่งชาติ

กทม. 10100

191. คุณจินตนา สกุลพราหมณ์

สำนักงานคณะกรรมการพัฒนาการเศรษฐกิจและสังคมแห่งชาติ

ถนนกรุงเกษม

กทม. 10100

192. ห้องสมุดสำนักงานคณะกรรมการวิจัยแห่งชาติ

196 ถนนพหลโยธิน

กทม. 10900

193. สำนักงานคณะกรรมการวิจัยแห่งชาติ

กองส่งเสริมการวิจัย

196 ถนนพหลโยธิน

กรุงเทพ 10900

194. เลขาธิการ

สำนักงานคณะกรรมการสิ่งแวดล้อมแห่งชาติ

80/1 ซอยอาคารพิบูลย์วัฒนา

ถนนสามเสนใน

กรุงเทพ 10400

195. ห้องสมุดสำนักงานพลังงานปรมาณูเพื่อสันติ

ถนนวิภาวดีรังสิต บางเขน

กทม. 10900

196. พ.ท. สมบุญ อินทรประสาท

สำนักเลขาธิการคณะรัฐมนตรี

สำนักนายกรัฐมนตรี

กทม. 10300

197. เลขาธิการ

สำนักงานเลขาธิการอาเซียนแห่งชาติ (ไทย)

วังสราญรมย์

กทม. 10200

198. ห้องสมุดสำนักงานสถิติแห่งชาติ

สำนักงานสถิติแห่งชาต

ถนนหลานหลวง

กทม. 10100

199. คุณศุภร ศุขเสรี

พัฒนากรอำเภอท่าฉาง

อำเภอท่าฉาง

จ. สุราษฎร์ธานี

200. หอสมุดแห่งชาติ

ท่าวาสุกรี

ถนนสามเสน

กทม.

จดหมายข่าว
ศูนย์ข้อมูลพลังงานแห่งประเทศไทย
NEIC NEWS

ปีที่ 1 ฉบับที่ 4 พฤศจิกายน 2526

กองนโยบายและวางแผนพลังงาน สำนักงานพลังงานแห่งชาติ

สารบัญ

จดหมายข่าวศูนย์ข้อมูลพลังงานแห่งประเทศไทย เป็นเอกสารออกราย 3 เดือน มีวัตถุประสงค์เพื่อประชาสัมพันธ์กิจกรรมของศูนย์ข้อมูลฯ กับหน่วยงานอื่นๆ และผู้สนใจทั่วไป จัดทำโดย

- ศูนย์ข้อมูลพลังงานแห่งประเทศไทย
- กองนโยบายและวางแผนพลังงาน
- สำนักงานพลังงานแห่งชาติ

ถนนพระราม 1 กรุงเทพฯ 10500 โทร. 223-0021 ต่อ 203

โครงการ
Renewable Non-conventional Energy(ต่อ)

จดหมายข่าวศูนย์ข้อมูลพลังงานแห่งประเทศไทยในฉบับที่ 2 ได้นำบทความเรื่องโครงการ Renewable Nonconventional Energy ซึ่งเป็นโครงการช่วยเหลือขององค์การยูเสดมาเสนอ โดยกล่าวรายละเอียดของโครงการย่อยไปแล้วทั้งหมด 7 โครงการ ในฉบับนี้จะขออธิบายวัตถุประสงค์และเป้าหมายของโครงการที่เหลืออีก 7 โครงการ ดังนี้คือ

โครงการการใช้ประโยชน์ความร้อนจากแสงอาทิตย์

(Solar Process Heat Project)

หน่วยงานที่รับผิดชอบการดำเนินงาน : สถาบันเทคโนโลยีพระจอมเกล้า วิทยาเขตธนบุรี

รายนามหัวหน้าโครงการและผู้ช่วย : ดร.ปรีดา วิบูลย์สวัสดิ์

ดร.กฤษณพงศ์ กีรติกร

วัตถุประสงค์และเป้าหมายของโครงการ

1. สร้างและพัฒนาเครื่องอบแห้งและเครื่องกลั่นน้ำด้วยแสงอาทิตย์โดยให้มีพื้นที่รับแสงรวม 20 ตารางเมตร
2. สร้างและพัฒนาเครื่องทำน้ำแข็งโดยใช้พลังงานจากแสงอาทิตย์สำหรับหมู่บ้านในชนบท กำลังผลิต 15 กก./วัน

โครงการปรับปรุงการผลิตถ่าน

(Improved Charcoal Production Project)

หน่วยงานที่รับผิดชอบการดำเนินงาน : กรมป่าไม้

รายนามหัวหน้าโครงการ : ดร.อรุณ ชมชาญ

วัตถุประสงค์และเป้าหมายของโครงการ

1. เพื่อให้ทราบถึงข้อมูลการผลิต การจำหน่าย และการใช้ถ่านในกิจการต่างๆ ทั่วประเทศสำหรับใช้ประกอบในการวางแผนพัฒนาพลังงานของประเทศ

2. เพื่อพัฒนากรรมวิธีการผลิตถ่านขนาดเล็กในชนบทให้มีประสิทธิภาพดียิ่งขึ้น ได้ถ่านปริมาณเพิ่มขึ้นต่อหน่วยวัตถุดิบ และมีคุณภาพดีอันจะเป็นการลดความต้องการไม้เชื้อเพลิงลงได้ทางหนึ่ง

3. เพื่อส่งเสริม และเผยแพร่เทคโนโลยีการผลิตถ่านที่ได้ทดสอบหรือพัฒนาแล้ว และเห็นว่าเหมาะสมให้แพร่หลายยิ่งขึ้น โดยการฝึกอบรมและช่วยเหลือประชาชนผู้ทำการผลิตถ่านในชนบทและแก่เจ้าหน้าที่ของรัฐซึ่งปฏิบัติงานในสนามเกี่ยวกับการพัฒนาชนบทและพลังงานท้องถิ่น ตลอดจนสถาบันการศึกษาในชนบท และองค์การกุศลสาธารณะที่เกี่ยวข้อง

โครงการปรับปรุงเตาหุงต้ม

(Stove Improvement Project)

หน่วยงานที่รับผิดชอบการดำเนินงาน : กรมป่าไม้

รายนามหัวหน้าโครงการ : ดร. อรุณ ชมชาญ

วัตถุประสงค์และเป้าหมายของโครงการ

1. เพื่อให้ทราบถึงประสิทธิภาพใช้งานของเตาหุงต้มในครัวเรือนที่ใช้ชีวมวลในปัจจุบัน

2. เพื่อพัฒนาเตาหุงต้มชีวมวล 3 ประเภทคือ เตาถ่าน เตาฟืน และเตาใช้เศษเหลือจากพืชเกษตรอื่นๆ ให้มีประสิทธิภาพดียิ่งขึ้นประหยัดเชื้อเพลิง และเหมาะสมกับสภาพการใช้งานในครัวเรือน

3. เพื่อส่งเสริมและเผยแพร่เตาหุงต้มทั้ง 3 ประเภท ที่ได้ทดสอบหรือพัฒนาแล้ว ว่าเป็นเตาที่มีประสิทธิภาพสูงให้แพร่หลายยิ่งขึ้น

โครงการเผาชีวมวลผลิตก๊าซชีวภาพ

(Biomass Gasification Project)

หน่วยงานที่รับผิดชอบดำเนินงาน : จุฬาลงกรณ์มหาวิทยาลัย

รายนามหัวหน้าโครงการ : ดร. วรพัฒน์ อรรถยุกติ

วัตถุประสงค์และเป้าหมายของโครงการ : เพื่อสร้างและประกอบ

1. ระบบเผาชีวมวลที่ใช้ไม้ และถ่านผลิตไฟฟ้า ขนาดกำลังผลิตติดตั้ง 500 วัตต์
2. ระบบเผาชีวมวลที่ใช้ซังข้าวโพด ขนาด 7 แรงม้า
3. ระบบขนาด 16 กำลังม้า เพื่อการสูบน้ำ
4. ระบบเผาแกลบผลิตไอร้อนโดยเตาเผาแบบ ฟลูอิดไดซ์เบด
5. ระบบขนาด 20-50 กิโลวัตต์ไฟฟ้า เพื่อผลิตไฟฟ้าโดยใช้ไม้จากแปลงฟืนตามโครงการแปลงฟืนประจำหมู่บ้าน

โครงการไฟฟ้าพลังน้ำขนาดเล็ก

(Mini Hydro Power Project)

หน่วยงานที่รับผิดชอบการดำเนินงาน : สำนักงานพลังงานแห่งชาติ

รายนามหัวหน้าโครงการ : นายสวัสดิ์ เหมกมล

วัตถุประสงค์และเป้าหมายของโครงการ

สร้างและพัฒนาโรงไฟฟ้าพลังน้ำขนาดเล็ก 4 โครงการคือ

1. โครงการบ่อแก้ว ขนาด 2×100 กิโลวัตต์
2. โครงการคำปอง ขนาด 2×20 กิโลวัตต์
3. โครงการแม่ตอนหลวง ขนาด 1×35 กิโลวัตต์
4. โครงการห้วยปุย ขนาด 1×50 กิโลวัตต์

โครงการเทคโนโลยีการสูบน้ำด้วยพลังงานหมุนเวียน

(Water Lifting Technology Project)

หน่วยงานที่รับผิดชอบการดำเนินงาน : สำนักงานพลังงานแห่งชาติ

รายนามหัวหน้าโครงการ : ดร. โอภาร รัตนปราการ

วัตถุประสงค์และเป้าหมายของโครงการ

1. เพื่อติดตั้งและทดสอบระบบสูบน้ำจากพลังงานแสงอาทิตย์ พลังงานลม ก๊าซชีวมวล และระบบเผาไม้ผลิตก๊าซเชื้อเพลิง

2. เพื่อใช้งาน และประเมินขีดความสามารถของระบบสูบน้ำจากพลังงานแสงอาทิตย์ พลังงานลม และระบบเผาไม้ผลิตก๊าซเชื้อเพลิง

โครงการจัดตั้งศูนย์พัฒนาและเผยแพร่พลังงานภูมิภาค

(Regional Energy Centers)

หน่วยงานที่รับผิดชอบดำเนินงาน : สำนักงานพลังงานแห่งชาติ

รายนามหัวหน้าโครงการ: นายไพรัช วรเวช

วัตถุประสงค์และเป้าหมายของโครงการ

1. จัดตั้งศูนย์พัฒนาและเผยแพร่พลังงานภูมิภาคที่จังหวัดมหาสารคาม พิษณุโลก นครศรีธรรมราช และราชบุรี
2. จัดหาที่ดินสำหรับก่อตั้งศูนย์ฯ ในจังหวัดอุบลราชธานี และฉะเชิงเทรา
3. จัดหาเครื่องมืออุปกรณ์ที่จำเป็น สำหรับศูนย์ทั้ง 4 ดังกล่าวข้างต้น
4. สาธิตและเผยแพร่ข่าวสารตลอดจนรวบรวมข้อมูลประเมินผล อบรม และฝึกหัดด้านพลังงานในภูมิภาค

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อนาคตของกระบวนการผลิตก๊าซชีวมวล

ผศ. ดร. วรพัฒน์ อรรถยุกติ*

บทนำ

การนำเครื่องกำเนิดก๊าซชีวมวลมาใช้เติมเครื่องยนต์ เริ่มมีมาตั้งแต่ต้นศตวรรษที่ 20 ในภาคพื้นยุโรป แต่เทคโนโลยีนี้ไม่ได้แพร่หลายจนถึงราว 7 ปี ก่อนสงครามโลกครั้งที่ 2 กองทัพเยอรมันได้แลเห็นความสำคัญของเครื่องผลิตก๊าซชีวมวล ในการแก้ปัญหาการขาดแคลนน้ำมันในยามจำเป็นได้ ถึงขนาดมีการบรรจุกรรมวิธีในการสร้าง และใช้ระบบก๊าซชีวมวลไว้ในหลักสูตรของทหารยานเกราะในกองทัพ เมื่อสงครามโลกครั้งที่ 2 เกิดขึ้นในปี 2482 ปัญหาการขาดแคลนน้ำมันเบนซินมีอยู่โดยทั่วไป ทำให้บางประเทศหันมาสร้างเครื่องกำเนิดก๊าซชีวมวลเพื่อนำมาขับเครื่องยนต์ แม้กระทั่งในประเทศไทยก็มีรถถ่านใช้ในสมัยสงคราม ในประเทศญี่ปุ่นก็มีรถยนต์ถ่านใช้เช่นกัน ในปี 2488 เมื่อสงครามโลกครั้งที่ 2 ยุติลง ปรากฏว่ามีรถยนต์ที่ติดระบบก๊าซชีวมวล เป็นจำนวนหลายแสนคันทั่วโลก แต่หลังจากนั้น เมื่อประเทศต่าง ๆ สามารถซื้อขายน้ำมันเบนซินได้อย่างเสรี เครื่องกำเนิดก๊าซชีวมวลดังกล่าวก็กลายเป็นเทคโนโลยีล้าสมัยในทันทีทันใด เครื่องกำเนิดก๊าซชีวมวลไม่สามารถหาดูได้เลยในปัจจุบัน นับว่าเป็นเรื่องน่าเสียดายอย่างมาก

พลังงานจากชีวมวลถือว่าเป็นพลังงานหมุนเวียนประเภทหนึ่ง ภายหลังปี พ.ศ.2516 วิกฤตการณ์พลังงานได้ทำให้ประเทศต่าง ๆ ทั่วโลก หันมาสนใจพลังงานหมุนเวียนกันอย่างจริงจัง จุดแรกเริ่มความสนใจของวงการวิจัยด้าน

หัวหน้าภาควิชาวิศวกรรมเคมี คณะวิศวกรรมศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
หัวหน้าโครงการย่อยเผาชีวมวลผลิตก๊าซเชื้อเพลิง

พลังงานหมุนเวียน ได้เน้นไปที่พลังงานแสงอาทิตย์โดยตรงกับพลังงานลม ต่อมาความสนใจได้หันมาสู่กระบวนการผลิตพลังงาน ในรูปของก๊าซชีวภาพและแอลกอฮอล์ โดยอาศัยขบวนการด้านปฏิกิริยาชีวภาพ และเมื่อ 2-3 ปีที่ผ่านมา นักวิทยาศาสตร์และวิศวกร ที่วิจัยเรื่องพลังงานหมุนเวียน ได้หันมาสนใจขบวนการผลิตก๊าซชีวมวล อันเป็นขบวนการแปรรูปพลังงานจากเชื้อเพลิงแข็งเป็นก๊าซชีวมวล โดยปฏิกิริยาที่เกิดจากความร้อนที่อาศัยชีวมวลเป็นวัตถุดิบ

ในรอบ 14 เดือนที่ผ่านมาได้มีการจัดสัมมนาทางวิชาการ ในเรื่องกระบวนการผลิตก๊าซชีวมวลถึง 3 ครั้งด้วยกัน ในราวกลางปี พ.ศ.2525 องค์การอาหารและเกษตรของสหประชาชาติได้จัดการสัมมนาระหว่างผู้เชี่ยวชาญด้านนี้ในประเทศฟิลิปปินส์และสาธารณรัฐประชาชนจีน ต่อมาในเดือนพฤศจิกายน 2525 สถาบัน BEIJER แห่งประเทศสวีเดนได้เป็นเจ้าภาพจัดการอบรมและสัมมนาทางวิชาการ ที่ประเทศศรีลังกา และในเดือนสิงหาคม 2526 องค์การอาหารและเกษตรของสหประชาชาติได้จัดสัมมนาทางวิชาการที่ประเทศมาเลเซียและประเทศไทย โดยมีผู้แทนหน่วยวิจัยชั้นนำของโลกเข้าร่วมสัมมนาอยู่ด้วย

ปัจจุบันนี้ กลุ่มวิจัยที่อยู่ในแนวหน้าของการวิจัย และพัฒนาระบบกำเนิดก๊าซชีวมวลดังกล่าวมีอยู่ดังนี้

มหาวิทยาลัย Twente แห่งประเทศเนเธอร์แลนด์

มหาวิทยาลัย California ที่เมือง Davis สหรัฐอเมริกา

มหาวิทยาลัย Philippine ประเทศฟิลิปปินส์

มหาวิทยาลัย Mie ประเทศญี่ปุ่น

มหาวิทยาลัยสงขลานครินทร์ ประเทศไทย

องค์กร CEEMATของรัฐบาลฝรั่งเศส

หน่วยงาน Tropical Research Institute ประเทศอังกฤษ

SERI รัฐโคโลราโด สหรัฐอเมริกา

หน่วยงานของกระทรวงต่างประเทศสาธารณรัฐประชาชนจีน

นอกจากหน่วยงานเหล่านี้ ยังมีบริษัทเอกชนอีกหลายบริษัทที่ทำการพัฒนาระบบก๊าซชีวมวลดังกล่าวในประเทศต่าง ๆ เช่น อเมริกา ฟิลิปปินส์ บราซิล ฝรั่งเศส เนเธอร์แลนด์ เยอรมัน สวิสเซอร์แลนด์ อิตาลี และอินเดีย เป็นต้น

ในปัจจุบันนี้ขบวนการก๊าซชีวมวลแบ่งได้เป็น 2 ส่วน คือเครื่องที่ใหญ่กว่า 100 แรงม้าและเครื่องที่เล็กกว่า 100 แรงม้า ซึ่งมักจะเป็นระบบที่ใช้เศษไม้เหลือจากโรงเลื่อยมาเป็นเชื้อเพลิงเพื่อขับเครื่องยนต์ หรือให้พลังงานความร้อนในโรงงาน ถ้าหากโรงงานนั้น ๆ ต้องการใช้พลังงานมากจริง ๆ กระบวนการก๊าซชีวมวลจะสู้ขบวนการเผาไหม้โดยตรง เพื่อผลิตไอน้ำไม่ได้ ทั้งนี้เพราะเครื่องยนต์เบนซินขนาดใหญ่ เช่น 1,000 แรงม้าขึ้นไปหาได้ยาก ในส่วนของระบบก๊าซชีวมวลตั้งแต่ 100 แรงม้าขึ้นไป ปัญหาทางเทคโนโลยีไม่มีเลย และหลายบริษัททั่วโลก ได้ผลิตระบบเหล่านี้ออกจำหน่าย ในส่วนของระบบก๊าซชีวมวลที่เล็กกว่า 100 แรงม้า น่าสนใจเป็นอย่างมากสำหรับนำเอามาเป็นแหล่งพลังงานในชนบทของประเทศที่กำลังพัฒนา ไม่ว่าจะนำเอามาผลิตกระแสไฟฟ้าก็ดี เอามาสูบน้ำชลประทานก็ดี เอามาเป็นแหล่งพลังงานกลก็ดี หรือเอามาเป็นแหล่งพลังงานความร้อนสำหรับโรงงานชนบทก็ดี

ในส่วนของเครื่องที่เล็กกว่า 100 แรงม้าการนำเอาระบบดังกล่าวมาใช้ประโยชน์ในชนบทของประเทศที่กำลังพัฒนาเป็นเรื่องที่ไม่ง่ายเลย และหากมองดูทั่วโลก สามารถกล่าวได้ว่าเทคโนโลยีดังกล่าวยังไม่แพร่หลายนัก

<u>เทคโนโลยีและประสบการณ์ของประเทศต่าง ๆ</u>

การพัฒนาเทคโนโลยีสำหรับเครื่องกำเนิดก๊าซชีวมวลที่มีขนาดใหญ่กว่า 100 แรงม้า กระทำกันอยู่ในบริษัทเอกชนทั่วโลก และเป็นเทคโนโลยี ที่สืบเนื่องจากเทคโนโลยีของการผลิตก๊าซจากถ่านหิน ระบบที่นิยมใช้กันอย่างกว้างขวางในปัจจุบัน ได้แก่ระบบ Fluidized Bed โดยอาศัยขยะหรือเศษไม้จากโรงเลื่อยเป็นเชื้อเพลิง ในบางกรณีอาจจะใช้วัสดุเหลือทางการเกษตรเป็นเชื้อเพลิง บางบริษัทยังคงผลิตเครื่องกำเนิดก๊าซชีวภาพที่ใหญ่ แต่ใช้ระบบ Fixed Bed อยู่ ในอนาคตคิดว่าแนวโน้มจะมีการใช้ระบบ Fluidized Bed เป็นส่วนใหญ่ การพัฒนาเครื่องกำเนิดก๊าซชีวมวล ได้ก้าวหน้าไปมากในประเทศบราซิลและฟิลิปปินส์ ผู้เขียนไม่มีข้อมูลสำหรับประเทศบราซิล แต่ได้มีโอกาสไปดูโครงการพัฒนาระบบก๊าซชีวมวลในประเทศฟิลิปปินส์มาแล้ว ฟิลิปปินส์ได้ทำการค้นคว้าวิจัยเรื่องระบบก๊าซชีวมวลมา เป็นเวลาไม่ต่ำกว่า 15 ปี โดยศาสตราจารย์ Ibarra E. Cruz แห่งมหาวิทยาลัยฟิลิปปินส์ เมื่อประมาณ 3 ปีที่ผ่านมา รัฐบาลฟิลิปปินส์ได้ออกประกาศจัดตั้งบริษัทของรัฐบาลชื่อ GEMCOR มีหน้าที่ผลิตระบบก๊าซชีวมวลขนาดต่าง ๆ ให้ประชาชนซื้อเอาไปใช้ปีละหลายพันเครื่อง เครื่องดังกล่าวใช้ถ่าน

ไม้ กระถินยักษ์ หรือถ่านจากกะลามะพร้าวโดยนำไปขับรถกระบะ ขับเรือประมง สูบน้ำชลประทาน ผลิตกระแสไฟฟ้า เดินเครื่องนวดข้าวและกิจกรรมอื่น ๆ อีกหลายอย่างควบคู่กับการสร้างเครื่องก๊าซชีวมวลดังกล่าว รัฐบาลฟิลิปปินส์ได้จัดทำโครงการปลูกป่ากระถินยักษ์ และสนับสนุนให้ชาวบ้านรู้จักทำเตาเผาถ่านเพื่อรองรับตลาดถ่านที่จะตามมาในอนาคต

ในทางเทคโนโลยี ตัวกำเนิดก๊าซมีลักษณะเป็นลมพัดลง มีรูให้ลมเข้ารอบเตาและมีคอ ตามแบบของ Imbert ของประเทศสวีเดน ฟิลิปปินส์กำลังจะพัฒนาเครื่องกำเนิดก๊าซชีวมวลเหล่านี้ ให้สามารถใช้ไม้แห้งและวัสดุทางการเกษตรอื่น ๆ ในการสัมมนาทางวิชาการที่มาเลเซียในเดือนสิงหาคม 2526 ศาสตราจารย์ Cruz ได้เสนอเครื่องกำเนิดก๊าซโดยใช้แกลบข้าวเป็นเชื้อเพลิง แบบของศาสตราจารย์Cruz เป็นแบบที่ใหม่มาก และยังไม่มีผู้ใดได้เคยคิดทำแบบนี้มาก่อน ในส่วนของการทำความสะอาดก๊าซชีวมวลที่เกิดขึ้น ประเทศฟิลิปปินส์ได้พัฒนาวิธีการจนสามารถใช้การได้ดี

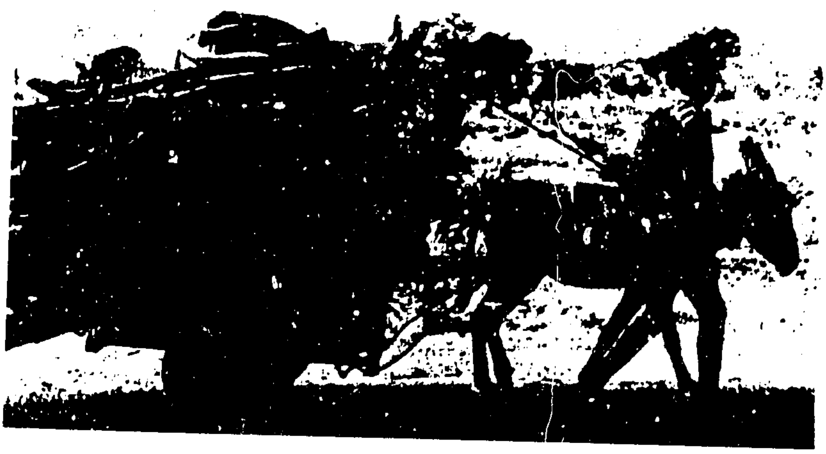
ประเทศจีน มีข้อเสียงในการออกแบบสร้างและใช้เครื่องกำเนิดก๊าซชีวมวล โดยใช้แกลบข้าวเป็นเชื้อเพลิง เครื่องแบบนี้มักมีปัญหาในเรื่องการไหลของแกลบข้าวผ่านเตา การที่แกลบข้าวหลอมตัว และปิดช่องทางไหลผ่านของแกลบข้าวอื่น ๆ รวมทั้งปริมาณยางไม้ที่เกิดขึ้น แต่ประเทศจีนสามารถแก้ปัญหาเหล่านี้ได้ โดยมีระบบที่เดินได้อย่างต่อเนื่อง ไม่ต้องยกเครื่องทำความสะอาดบ่อย ๆ ในมหาวิทยาลัยแคลิฟอร์เนียที่เมืองเดวิส มีการวิจัยเรื่องการผลิตก๊าซชีวมวลจากแกลบข้าว และเป็นงานวิจัยที่น่าสนใจเป็นอย่างยิ่ง แต่ระบบดังกล่าวยังไม่ได้นำเอาไปใช้ในชนบทของประเทศที่กำลังพัฒนา

ในประเทศไทยนั้น ดร.นักสิทธิ์ คูวัฒนชัยแห่งมหาวิทยาลัยสงขลานครินทร์ ได้รับรางวัลวิจัยดีเด่นจากสภาวิจัย ประจำปี 2526 ผลงานของดร.นักสิทธิ์ ได้แก่การพัฒนาเครื่องกำเนิดก๊าซชีวมวลที่ใช้ไม้เป็นเชื้อเพลิงโดยประสบความสำเร็จในการกำจัดยางไม้ ทำให้กระบวนการทำความสะอาดก๊าซที่เกิดขึ้นมีปัญหาน้อยที่สุด ระบบที่ได้พัฒนา เป็นแบบที่พัฒนามาจากแบบของ Imbert เช่นเดียวกับประเทศฟิลิปปินส์ แต่สามารถใช้ไม้เป็นเชื้อเพลิงได้

ปัจจุบันนี้ งานพัฒนามักมุ่งไปสู่เครื่องลมพัดลงที่มีคอในช่วงล่าง แบบเดียวกับที่มหาวิทยาลัย Twente ในประเทศเนเธอร์แลนด์ ได้สร้างระบบขนาด 40 แรงม้า และเอาไปติดตั้งในประเทศศรีลังกา โดยใช้กะลามะพร้าวแห้งเป็นเชื้อเพลิง แต่เดิมผู้สร้างคิดว่าจะ

สามารถกำจัดยางไม้ภายในเตาเอง ประเด็นสำคัญของระบบนี้ผู้สร้างบอกว่าอยู่ที่กระบวนการทำความสะอาดก๊าซมิใช่อยู่ที่ตัวกำเนิดก๊าซ ในเรื่องนี้กลุ่มผู้วิจัยอื่นยังไม่ค่อยเห็นด้วยนัก เมื่อการประชุมทางวิชาการที่ประเทศมาเลเซีย ผู้เขียนได้เสนอว่า ประเทศไทยมีความห่วงใยเรื่องการเผยแพร่ระบบกำเนิดก๊าซ ที่ใช้ไม้และถ่านเป็นเชื้อเพลิง เนื่องจากป่าไม้ของประเทศไทยกำลังจะหมดสิ้น จึงได้เสนอแนะให้กลุ่มวิจัยต่าง ๆ มุ่งพัฒนาเครื่องกำเนิดก๊าซชีวมวลจากแหล่งชีวมวลอื่น ๆ ที่ไม่ใช่ไม้ ได้รับการทักท้วงว่า ไม้ยางพาราที่จะต้องตัดทุกปีในไทยมีจำนวนมากพอพร้อมทั้งเสนอโครงการปลูกต้นไม้ประจำหมู่บ้าน ซึ่งอาจจะเป็นแหล่งไม้สำหรับเครื่องกำเนิดก๊าซชีวมวล แต่ผู้แทนจากประเทศอินเดียมีความเห็นเช่นเดียวกับผู้เขียนว่า อนาคตจะต้องพิจารณาใช้วัสดุเหลือทางการเกษตร เป็นวัตถุดิบสำหรับเครื่องกำเนิดก๊าซชีวมวล

อนาคตของเทคโนโลยีการผลิตก๊าซชีวมวลมีแนวโน้มอยู่ที่การนำเอาชีวมวลต่าง ๆ มาตากแห้ง บด และอัดเป็นท่อน หรือชิ้นเล็ก ๆ เพื่อเอาไปป้อนในเครื่องกำเนิดก๊าซ ทั้งนี้เพื่อให้สามารถรักษาคุณสมบัติของเชื้อเพลิงแห้ง ให้ได้มาตรฐานด้านความชื้น ปริมาณขี้เถ้าของเชื้อเพลิง และลักษณะคุณสมบัติอื่น ๆ ของเชื้อเพลิง หากสามารถพัฒนาเชื้อเพลิง ได้แบบที่กล่าวมานี้ คงจะสามารถคิดค้นเครื่องกำเนิดก๊าซ ที่ทำงานง่ายกว่าและดีกว่าเครื่องปัจจุบัน



การเผยแพร่ของระบบกำเนิดก๊าซที่ใช้ไม้และถ่านเป็นเชื้อเพลิง อาจส่งผลกระทบทำให้ป่าไม้หมดลงในอัตราในรวดเร็วกว่าเดิม

แหล่งชีวมวลที่มีอยู่ในประเทศไทย

เนื่องด้วยแหล่งป่าไม้ธรรมชาติ กำลังจะหมดสิ้นไปจากประเทศไทย แหล่งชีวมวลอื่นๆ เช่นวัสดุเหลือทางการเกษตร กำลังเป็นที่สนใจของนักวิทยาศาสตร์และวิศวกร ในการพัฒนาแหล่งพลังงานหมุนเวียนจากชีวมวลใน 2 ลักษณะ คือ นำชีวมวลมาบด มาตากแห้ง หรือนำมาอัดเป็นก้อนหรือเป็นเชื้อเพลิงเพื่อทดแทนฟืน และลักษณะที่สองคือนำเอาชีวมวลเหล่านี้มาเป็นวัตถุดิบเพื่อป้อนเข้าเครื่องกำเนิดก๊าซชีวมวล

ผู้เขียนได้ทำการสำรวจเบื้องต้นเกี่ยวกับชีวมวลที่มีอยู่ในประเทศไทย และได้แบ่งชีวมวลออกเป็น 3 ประเภท ประเภทที่หนึ่ง ได้แก่ชีวมวล **ซึ่งไม่ได้อยู่ในวงจรเศรษฐกิจของประ**เทศ ในกลุ่มนี้พืชที่น่าสนใจที่สุดได้แก่ ผักตบชวาและไมยราบยักษ์ สำหรับผักตบชวานั้นมีปัญหาในการเก็บเกี่ยว ในการขับไล่น้ำ ในการตากแห้ง และการอัดเป็นแท่งเชื้อเพลิง นักวิทยาศาสตร์บางคนยังมีความเห็นว่าผักตบชวาน่าจะเป็นเชื้อเพลิงสำหรับขบวนการปฏิกิริยาชีวภาพมากกว่าที่จะเอามาตากแห้ง และใช้ในเครื่องกำเนิดก๊าซชีวมวล แต่ผักตบชวาเป็นพืชที่น่าสนใจมาก เพราะเหตุว่า อัตราการเจริญเติบโตสูงที่สุดในโลก(อาจจะถึง 70 T/ha-y) สำหรับไมยราบยักษ์ซึ่งเป็นพืชที่ขึ้นเองและเจริญเติบโตเองในภาคเหนืออาจจะเป็นแหล่งชีวมวลที่น่าสนใจ ได้มีการว่าจ้างชาวบ้านตัดไมยราบยักษ์แต่พบปัญหาว่าชาวบ้านไม่ชอบตัดต้นดังกล่าว เนื่องด้วยมีหนามมากมาย จึงคิดว่าการเก็บเกี่ยวพืชชนิดนี้จะมีปัญหามากในอนาคต ชีวมวลประเภทที่สอง ได้แก่สวนยางและป่าไม้ชายเลน สำหรับป่าไม้ชายเลน นิยมนำมาใช้เป็นวัตถุดิบในการทำถ่านเพื่อการหุงต้ม สำหรับไม้ยางพาราซึ่งต้องโค่นล้มเพื่อปลูกต้นใหม่ สามารถได้เนื้อไม้ถึง 12.5 ล้านลูกบาศก์เมตรอย่างน้อยและโดยเฉพาะภาคใต้เป็นแหล่งสวนยางที่สำคัญที่สุด แต่เนื่องจากสวนยางบางแห่งอยู่ไกลจากเส้นทางคมนาคมจึงไม่สามารถจะนำออกมาขายได้ และชาวบ้านก็ไม่ค่อยนิยมใช้ถ่านจากไม้ยางพารา เนื่องจากน้ำหนักเบามากและถ่านจะหมดเร็ว **จึงคิดว่าไม้**ยางพาราเป็นเชื้อเพลิงที่น่าสนใจสำหรับเครื่องกำเนิดก๊าซชีวมวล

ชีวมวลประเภทที่สาม ได้แก่วัสดุเหลือทางการเกษตร ซึ่งจากการสำรวจได้จำแนกชีวมวลที่ประเทศไทยมีอยู่ แต่ชาวชนบทใช้ไม่หมด อันดับแรกคือ กะลามะพร้าวและซังข้าวโพด ซึ่งมีเหลืออยู่เป็นจำนวนมากในประเทศไทย และประเทศอื่นเช่นแทนซาเนีย ศรีลังกา ซึ่งเขาได้จัดสร้างระบบผลิตกระแสไฟฟ้า จากชีวมวลเหล่านี้ โดยอาศัยระบบก๊าซชีวมวลเป็นที่สำเร็จ

แล้ว และใช้งานอยู่จนทุกวันนี้(ใช้งานอยู่ในเชิงของการทดลอง ที่ได้รับความสำเร็จพอสมควร) วัสดุทางการเกษตรประเภทต่อมา ที่น่าสนใจสำหรับเครื่องกำเนิดก๊าซชีวมวลได้แก่แกลบข้าว ต้นมันสำปะหลัง ใยมะพร้าว ต้นฝ้าย เป็นต้น วัสดุทางการเกษตรเหล่านี้ ยังมีปัญหาอยู่บ้างในแง่เทคโนโลยี แต่สำหรับเทคโนโลยีที่ใช้แกลบข้าวกำลังก้าวหน้าไปอย่างรวดเร็ว และคาดว่าภายใน 1 ปีจะมีระบบที่ออกเผยแพร่ได้ ชีวมวลประเภทที่สามได้แก่วัสดุทางการเกษตรอื่น ๆ ที่จะต้องมาผ่านขบวนการตัด ตากแห้งและอัดเป็นแท่งเชื้อเพลิง เช่น ฟางข้าว ต้นข้าวโพด ฯลฯ ในปัจจุบันยังไม่มีการนำเอาเชื้อเพลิงอัดแท่งมาใช้กับเครื่องกำเนิดก๊าซชีวมวล แต่ในอนาคตผู้เขียนมีความเห็นว่า เทคโนโลยีนี้จะต้องเกิดขึ้น

ถ้าจะคำนวณพลังงาน ที่บรรจุอยู่ในชีวมวลเหล่านี้ จะพบว่าเป็นปริมาณมากมายและอาจจะเทียบเท่ากับพลังงาน ที่ประเทศไทยต้องสั่งซื้อมาจากต่างประเทศในรูปน้ำมันดิบ แต่ข้อเสียของแหล่งพลังงานเหล่านี้ คือ การกระจัดกระจายของชีวมวลในที่ต่าง ๆ ตามชนบทของไทย

<u>แนวโน้มสำหรับประเทศไทย</u>

องค์ประกอบที่สำคัญที่จะเป็นตัวชี้ถึงบทบาทของเครื่องกำเนิดก๊าซชีวมวล ในประเทศไทยในอนาคต ขึ้นอยู่กับองค์ประกอบหลายอย่าง อันได้แก่ ความสำเร็จของเทคโนโลยี และการยอมรับของเทคโนโลยีภายในประเทศไทย ประการที่สองคือ ระบบก๊าซชีวมวลจะเข้ามาทดแทนระบบพลังงานปกติได้ ต่อเมื่อพลังงานจากระบบใหม่ถูกกว่าระบบปกติอย่างแน่นอน และในเวลาเดียวกันผู้ใช้เครื่องจริงหมายถึงช่างและคนงานจะต้องยินยอมใช้ระบบใหม่ด้วยความเต็มใจทั้งๆ ที่ระบบก๊าซชีวมวลมีความสะดวกสบายในการใช้น้อยกว่าปกติ ผู้เขียนได้เคยสนทนากับผู้เชี่ยวชาญเรื่องระบบก๊าซชีวมวล ซึ่งได้เคยออกไปสัมภาษณ์คนสูงอายุในประเทศอิตาลี ซึ่งเคยใช้ระบบนี้เมื่อ 40 ปีก่อนในระหว่างสงครามโลกครั้งที่ 2 โดยทั่วไปแล้ว คนชราเหล่านี้มักจะมีความทรงจำเกี่ยวกับระบบก๊าซชีวมวล ในทางที่ว่าระบบเหล่านี้ไม่สะดวกเอาเสียเลย โดยเฉพาะ การที่จะต้องเอาเครื่องยนต์มาล้างอยู่บ่อย ๆ แต่เขาเหล่านั้นก็ยอมรับว่า ระบบก๊าซชีวมวลได้ช่วยเหลือประเทศของเขามากในยามวิกฤต

สำหรับประเทศไทยนั้น ผู้เขียนได้ถามตัวเองอยู่บ่อยครั้งว่า เครื่องกำเนิดก๊าซชีวมวลจะเข้ามามีบทบาทมากน้อยเพียงไรสำหรับประเทศไทยในอนาคต ซึ่งเป็นคำถามที่ตอบได้ [illegible]

เนื่องจากตัวแปรมีอยู่มากมาย อาทิเช่น โครงการส่งเสริมให้ชาวชนบทใช้ก๊าซ LPG อย่างกว้างขวางหรือโครงการไฟฟ้าในชนบทของการไฟฟ้าส่วนภูมิภาค แม้กระทั่งโครงการก๊าซชีวภาพของสำนักงานพลังงานแห่งชาติ

เมื่อมาศึกษาดูสถานภาพของเทคโนโลยีที่มีอยู่ในปัจจุบัน เราอาจจะพูดได้ว่า เรามีความรู้พอสมควรในการที่จะออกแบบสร้างระบบก๊าซชีวมวลที่ใช้เชื้อเพลิงทั้งต่อไปนี้ ถ่านไม้ ไม้ฟืน กะลามะพร้าว และซังข้าวโพด สิ่งที่ขาดอยู่คือหน่วยงานของรัฐบาล หรือบริษัทเอกชน ที่สามารถทำการออกแบบ สร้าง สาธิตและจำหน่ายเครื่องเหล่านี้ให้ประชาชนในลักษณะเดียวกับบริษัท GEMCOR ของประเทศฟิลิปปินส์ มีอยู่หลายประเทศ ที่ต้องการจะขายระบบเหล่านี้ให้ประเทศไทย แต่เมื่อมาดูราคาแล้ว ผู้เขียนเห็นว่าแพงเกินไป และไม่มีหนทางที่จะนำระบบดังกล่าวมาติดตั้งได้

ในระยะสั้น การสร้างและเผยแพร่เครื่องกำเนิดก๊าซชีวมวลภายในประเทศ จะไม่กระทบกระเทือนแหล่ง และราคาไม้ฟืนและถ่าน เพราะแต่ละเครื่องคงจะตั้งอยู่ห่างกัน แต่ในระยะยาวนั้นจะมีปัญหามาก หากระบบกำเนิดก๊าซชีวมวลได้รับความนิยมมาก ราคาไม้ฟืนและถ่านจะสูงขึ้นเนื่องจากความต้องการสูงขึ้น และชาวชนบท ผู้จะหาไม้ฟืนและถ่านเพื่อการหุงต้มภายในครัวเรือนอาจจะหาได้ยากขึ้น ประเทศฟิลิปปินส์เป็นประเทศแรกที่รัฐบาลได้จัดทำโครงการเผยแพร่การใช้ระบบก๊าซชีวมวลจากถ่านไม้ และในการเผยแพร่อย่างกว้างขวางแบบนี้ เขาได้แลเห็นปัญหาด้านแหล่งวัตถุดิบ จึงได้มีโครงการใหญ่อีก 2 โครงการ คือ โครงการปลูกป่าไม้เทียมโดยใช้ไมยราบยักษ์เป็นต้นหลัก และโครงการผลิตถ่านในหมู่บ้าน ซึ่งโครงการทั้งสองเป็นโครงการที่จะผลิตถ่านให้แก่เครื่องกำเนิดก๊าซชีวมวล ที่ทำการเผยแพร่อยู่ทั่วประเทศ ในการเผยแพร่เครื่องเหล่านี้ทั่วประเทศ ทางฟิลิปปินส์ได้วางหลักเกณฑ์ว่าจะเผยแพร่ระบบก๊าซชีวมวลเพื่อการคมนาคมเป็นหลัก และเพื่อเดินเครื่องสูบแรงในกิจกรรมการเกษตร เป็นอันดับรองลงมา สำหรับประเทศไทยนั้น ยังไม่มีการกำหนดวางแผนอย่างชัดแจ้งในเรื่องนี้ ในแนวความคิดเบื้องต้นของผู้ที่เกี่ยวข้องกับปัญหา รวมถึงผู้คิดค้นและสร้างระบบกำเนิดก๊าซชีวมวล มีความเห็นกว้าง ๆ ว่าระบบชีวมวลน่าจะมีไว้ในประเทศไทย เพื่อผลิตกระแสไฟฟ้า และเดินเครื่องยนต์ในแหล่งทุรกันดาร ที่ห่างไกลจากแหล่งไฟฟ้า ด้านวัตถุดิบนั้นคิดกันไว้ว่าระบบก๊าซชีวมวลน่าจะอยู่ใกล้บริเวณที่มีไม้เช่นป่าไม้ชุมชน (Woodlot) หรือในแหล่งอื่นที่มีไม้มากเช่นสวน

ยา:การาในภาคใต้ ในเรื่องวัตถุดิบนั้น หลายคนเป็นห่วงมากสำหรับอนาคต เกรงกันว่าหากระบบก๊าซชีวมวลได้รับความนิยมอย่างแพร่หลาย จะทำให้ป่าไม้หมดไปอย่างรวดเร็ว สำหรับระยะยาวนั้น มีความเห็นกันว่า ควรหันมาพัฒนาระบบก๊าซชีวมวล ที่ใช้วัสดุเหลือทางการเกษตรเป็นเชื้อเพลิง มีแกลบข้าว เป็นต้น แต่ในเรื่องการใช้วัสดุเหลือทางการเกษตรนั้น เทคโนโลยียังไม่พร้อม ไม่ว่าในประเทศใด

อนาคตของระบบก๊าซชีวมวล จึงขึ้นอยู่กับปัจจัยหลายอย่างด้วยกัน แม้แต่ผู้ที่เกี่ยวข้องโดยตรงกับเทคโนโลยีนี้ ก็ยังไม่สามารถบอกได้ถึง บทบาทของระบบพลังงานดังกล่าวในอนาคต ด้านการวิจัยและพัฒนาในแง่ต่าง ๆ ของระบบก๊าซชีวมวลดังกล่าว ยังมีสิ่งที่ต้องศึกษาอีกมากมาย เพราะปัจจุบันเป็นเพียงจุดเริ่มต้นเท่านั้นเอง

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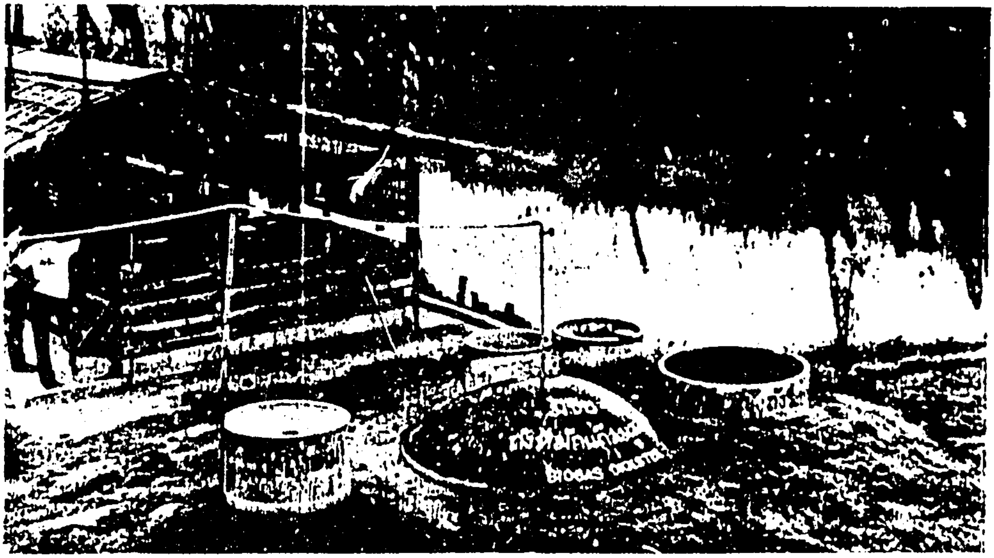


ในขณะที่ประเทศกำลังพัฒนาทั้งหลายต่างพยายามหาวิถีทางที่จะนำประเทศไปสู่สภาพที่ดีขึ้น ประเทศที่พัฒนาแล้วก็พยายามช่วยเหลือและส่งเสริมประเทศที่กำลังพัฒนาทั้งหลายเหล่านี้ VITA (Volunteers in Technical Assistance) เป็นองค์การหนึ่งในประเทศสหรัฐอเมริกาที่ตั้งขึ้น เพื่อให้ความช่วยเหลือประเทศกำลังพัฒนา ในฉบับนี้เจ้าหน้าที่ของศูนย์ข้อมูลฯ ได้เข้าพบ Mr. Marcus Sherman ผู้แทนของ VITA ในประเทศไทย และสนทนาเกี่ยวกับองค์การ VITA และงานของเขาในประเทศไทย

<u>ภูมิหลังของ VITA</u>

แรกเริ่มประมาณปีค.ศ. 1959 VITA เป็นเพียงกลุ่มบุคคลกลุ่มเล็กๆอันประกอบไปด้วยนักวิทยาศาสตร์ วิศวกร และนักธุรกิจ แต่ในปัจจุบัน VITA ได้ขยายตัวจนกลายเป็นองค์การหลัก ที่ให้ความช่วยเหลือแก่ประเทศกำลังพัฒนาถึง 100 ประเทศ หน้าที่ของVITA เปรียบเสมือนเป็นตัวเชื่อมโยงระหว่างวิทยาการ และเทคโนโลยีสมัยใหม่กับหมู่บ้านต่างๆในชนบทของประเทศกำลังพัฒนา วิศวกรและผู้เชี่ยวชาญด้านพลังงานของ VITA ประมาณ 4,000 คนจะให้บริการด้านพลังงานหมุนเวียน เกษตรกรรม กระบวนการผลิตอาหาร การจัดหาแหล่งน้ำและสุขาภิบาล และจะกระตุ้นให้ประชาชนในท้องถิ่นรู้จักใช้ความสามารถของตนเองและแหล่งทรัพยากรในท้องถิ่นเพื่อหาอาหาร น้ำ และพลังงานอย่างมีประสิทธิภาพยิ่งขึ้น นอกจากนี้ VITA ยังมีบริการตอบคำถามเกี่ยวกับข้อมูลทางเทคนิคแก่ผู้มีปัญหาในประเทศกำลังพัฒนาด้วย ดังเช่นในปี 1982 ศูนย์เอกสารของ VITA ได้บริการตอบปัญหาเกี่ยวกับพลังงาน เกษตรกรรม อาหาร แหล่งน้ำ และเรื่องอื่น ๆ ถึง 2,500 คำถาม จากอดีตจนถึงปัจจุบัน เป็นที่สังเกตได้ว่า VITA ทำงาน เพื่อประชาชนในชนบทของประเทศที่กำลังพัฒนามาโดยตลอด จึงทำให้ทราบความต้องการที่แท้จริงของชาวชนบท ดังนั้นงานหลักอีกส่วนหนึ่งของ VITA คือ การจัดทำโครงการเพื่อพัฒนางานในสาขาที่กล่าวข้างต้น เสนอแก่หน่วยงานของรัฐบาล บริษัท และองค์การอื่น ๆ ด้วย

VITAในประเทศไทย

ถ้าท่านมีโอกาสเดินทาง ไปยังจังหวัดพัทลุง ท่านอาจเห็นกังหันลมตัวหนึ่งจากกังหันทั้งหมด 14 ตัว กำลังวิดน้ำเข้าท้องนาโดยมีใบพัดสีธงชาติไทย Mr. Sherman ได้กล่าวอธิบายว่า แม้สภาพภูมิอากาศของประเทศไทยจะเอื้ออำนวยให้ชาวชนบทรู้จักใช้กังหันลม มาแต่สมัยโบราณแล้วก็ตาม แต่ชาวชนบทยังต้องการเทคโนโลยีใหม่ ๆ เพื่อช่วยพัฒนากังหันลมให้มีประสิทธิภาพมากขึ้น อีกทั้งยังดูแลรักษาได้ง่าย และมีราคาไม่สูงจนเกินไปด้วย ดังนั้น VITA จึงได้

พัฒนากังหันลมในรูปแบบทางการค้า เพื่อตอบสนองความต้องการของชาวชนบทดังกล่าว โดยให้สามารถซื้อกังหันลมและหาอะไหล่ได้โดยง่าย

โครงการ เกี่ยวกับพลังงานหมุนเวียนในด้านอื่น ๆ ของ VITA อาจสรุปได้ดังนี้

พลังงานลม

-ร่วมมือกับสำนักงานพลังงานแห่งชาติในการจัดเตรียมมาตรฐาน ซึ่งเป็นที่ยอมรับของนานาชาติ เพื่อทดสอบเครื่องสูบน้ำจากพลังงานลม นอกจากนี้สำนักงานพลังงานแห่งชาติยังได้ซื้อเครื่องสูบน้ำจากพลังงานลมที่ VITA ออกแบบ มาใช้ในสถานีทดลองที่จังหวัดยะลาด้วย

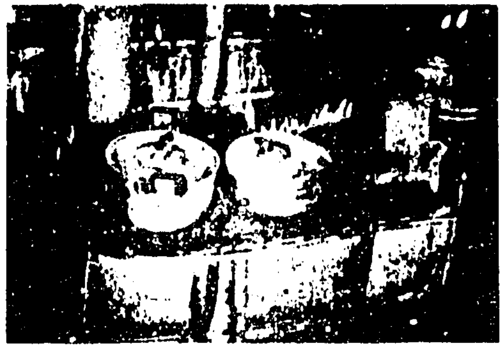
- ร่วมมือกับสภาวิจัยแห่งชาติในโครงการจัดทำเครื่องสูบน้ำจากพลังงานลม จำนวน 9,000 เครื่องให้กับหมู่บ้าน 1,000 แห่ง ภายในระยะเวลา 5 ปี

เตา

- กรมป่าไม้มอบให้ VITA วิเคราะห์และรายงานผลการทดสอบเตา พร้อมทั้งคำแนะนำที่อาจเป็นประโยชน์

- VITA มีโครงการทดสอบประสิทธิภาพของเตาหุงต้ม 26 แบบซึ่งทำจากดินเหนียวและใช้ฟางข้าวเป็นเชื้อเพลิง เพื่อให้สำนักงานข้าหลวงใหญ่ผู้ลี้ภัยแห่งสหประชาชาติ (United

เตาที่VITA พัฒนาขึ้น



เตาที่ UNHCR ใช้ในค่ายผู้ลี้ภัย

Nations High Commission for Refugees - UNHCR) เพื่อนำไปใช้ในค่ายผู้ลี้ภัยที่เขาอีด่าง ผลของการทดลองนี้ทำให้UNHCR สามารถสร้างเตาสำหรับใช้ในค่ายผู้ลี้ภัยได้มากกว่า 60 เตา นอกจากนี้ กรมการศึกษานอกโรงเรียนยังช่วยด้านข้อมูลโดยการจัดทำหนังสือคู่มือ และสื่อการสอนต่าง ๆ เกี่ยวกับเตาหุงต้มและเครื่องสูบน้ำจากพลังงานลมอีกด้วย

<u>ก๊าซชีวภาพ</u>

- ร่วมมือกับสถาบันการเกษตร และเทคโนโลยีแม่โจ้ จังหวัดเชียงใหม่ส่งเสริมการผลิตและการใช้ก๊าซชีวภาพ ขณะนี้มีเครื่องผลิตก๊าซชีวภาพจากมูลสุกรมากกว่า 60 เครื่อง วิธีการนี้นับว่าเป็นที่นิยมมากในภาคเหนือ เพราะนอกจากจะช่วยขจัดมูลสัตว์ และรักษาลักษณะสุขอนามัยแล้ว ยังเป็นแหล่งเชื้อเพลิงราคาถูกอีกด้วย

<u>เชื้อเพลิง</u>

- พัฒนาเครื่องยนต์ผลิตเชื้อเพลิงแข็งจากขี้เลื่อยและฟางข้าว เนื่องจากเครื่องยนต์ประเภทนี้มีราคาถูก และใช้ผลิตเชื้อเพลิงได้อย่างมีประสิทธิภาพ โรงงานอุตสาหกรรมในกรุงเทพฯหลายโรงงาน ได้สั่งซื้อเครื่องยนต์ดังกล่าวไปใช้งาน และมีคนไทยกลุ่มหนึ่งร่วมกันตั้งบริษัทผลิตเครื่องยนต์ชนิดนี้ออกจำหน่าย ขณะนี้ Mr. Sherman ได้รับการติดต่อจากรัฐบาลศรีลังกา อินโดนีเซีย และฟิลิปปินส์ให้ช่วยถ่ายทอดเทคโนโลยีนี้ในปีหน้าอีกด้วย

<u>แรงงานเท้า</u>

- VITA ร่วมกับโรงพยาบาลมหาวิทยาลัยเชียงใหม่ ศึกษาข้อมูลเกี่ยวกับเครื่องบดถั่วเหลือง ที่ใช้แรงงานเท้าของมนุษย์ เพื่อใช้

ผลิตอาหารในหมู่บ้านชาวเขา

Mr. Sherman กล่าวสรุปว่างานของ VITA ในประเทศไทยนั้น นับว่าประสบความสำเร็จพอควร แม้จะมีปัญหาบ้างบางประการ เช่น การสื่อสารทางภาษาเพื่อติดต่อกัน แต่ปัญหานี้ก็เป็นเรื่องเล็กน้อยมาก และเป็นสิ่งที่ไม่อาจหลีกเลี่ยงได้ อย่างไรก็ตาม จุดประสงค์สำคัญที่ VITA คำนึงคือการวางแผนและดำเนินการโครงการต่าง ๆ โดยพิจารณาถึงแหล่งทรัพยากรในท้องถิ่น และความต้องการที่แท้จริงของประชาชน

The answer, my friend, is blowing in the wind

ขณะนี้ความพยายามของ VITAในการผลักดันเทคโนโลยีด้านพลังงานหมุนเวียนให้ออกมาในรูปของการค้ากำลังเป็นรูปเป็นร่างมากขึ้น โครงการต่าง ๆ ที่หน่วยงานของรัฐบาล และเอกชนทำการทดลอง ได้กลายมาเป็นงานระดับชาติ ความพยายามขั้นต่อไปก็คือการทำให้งานเหล่านี้ เป็นที่ยอมรับทางอุตสาหกรรมเพื่อให้มีการผลิต และจำหน่ายกันอย่างจริงจัง

การเปลี่ยนแนวความคิด และวิธีการเก่า ๆ ของชาวชนบท ให้หันมายอมรับเทคโนโลยีใหม่ ๆ นั้น ไม่ใช่เรื่องง่าย อย่างไรก็ตามในบรรดาชาวชนบทเหล่านั้น คงมีสักคนหรือสองคนที่กระตือรือร้นที่จะแสวงหาวิธีการที่ดีกว่า ในการปรับปรุงชีวิต โดยไม่ทำลายแหล่งทรัพยากรธรรมชาติ และสภาวะแวดล้อมในท้องถิ่นเดิม เป็นที่คาดหวังว่า เมื่อคนเหล่านี้ได้รับการชี้แนะแนวความคิดใหม่ ๆ เพื่อปรับปรุงวิธีการเก่า ๆ ให้ดีขึ้น และได้รับการสนับสนุนด้านเงินทุนที่พอเพียงวิถีทางแห่งการพัฒนาก็จะเริ่มขึ้น

ศูนย์ข้อมูลฯ ขอขอบคุณ Mr. Marcus Sherman เป็นอย่างมาก ที่กรุณาสละเวลาให้สัมภาษณ์ครั้งนี้ หากท่านผู้อ่านต้องการทราบข้อมูลเกี่ยวกับหน่วยงาน และข่าวงานของ VITA เพิ่มเติม ท่านอาจติดต่อศูนย์ข้อมูลพลังงานแห่งประเทศไทยสำนักงานพลังงานแห่งชาติได้โดยตรง หรือที่สำนักงานของ VITA 48 ซอยอารีย์ ถนนพหลโยธิน โทรศัพท์ 2781826

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ข่าวพลังงาน

Coal Gasification ใต้พื้นดินเพื่อลดค่าใช้จ่าย

ห้องปฏิบัติการแห่งชาติ ลอว์เรนซ์ ลิเวอมอร์ (Lawrence Livermore National Laboratory) ได้รายงานผลการศึกษา เมื่อเร็ว ๆ นี้ว่า การสังเคราะห์ผลิตภัณฑ์เคมีหลายชนิด เช่น เมทานอล ไฮโดรเจน และคาร์บอนไดออกไซด์ ด้วยวิธี coal gasification ใต้พื้นดินจะลดค่าใช้จ่ายลงไปได้อย่างมาก ตัวอย่างเช่น เราอาจสังเคราะห์เมทานอลด้วยวิธีใหม่นี้ โดยเสียค่าใช้จ่ายเพียง 11.53 ถึง 13.83 บาทหรือ 50 ถึง 60 เซ็นต์ต่อแกลลอน ในขณะที่การสังเคราะห์ด้วยวิธีเก่าจะเสียค่าใช้จ่ายถึง 16.14 ถึง 18.44 บาท หรือ 70 ถึง 80เซ็นต์ต่อแกลลอน นับได้ว่าลดค่าใช้จ่ายลงไปได้ถึง25%

ดักลาส อาร์ สตีเฟนส์ หัวหน้าทีมงาน Coal Gasification ใต้พื้นดินของห้องปฏิบัติการนี้กล่าวว่า วิธีการนี้ "มีคุณค่าทางเศรษฐกิจแม้ว่าราคาน้ำมันจะถูกลงแล้วก็ตาม" เขายังอธิบายเพิ่มเติมว่า การใช้เมทานอลในการเพิ่มค่าออกเทนของเครื่องยนต์แก๊สโซลีนที่ไม่มีตะกั่ว คาดว่าจะเพิ่มปริมาณขึ้นด้วย

นักวิทยาศาสตร์ ของห้องปฏิบัติการนี้ กล่าวว่า เขาสามารถสกัดพลังงานปริมาณมากกว่าก๊าซธรรมชาติสำรองของสหรัฐอเมริกา ถึง 50 เท่า จากถ่านหินจำนวน 1.2 ล้านล้านตัน โดยใช้วิธี gasificationใต้พื้นดิน

Energy Insider 6,7 (July 1983): 5.

กระบวนการ coal liquefaction

โรงงาน coal liquefactionของสถาบันวิจัยพลังงานไฟฟ้า (Electric Power Research Institute) เมืองวิลสันวิลล์ รัฐอลาบามาได้พัฒนากระบวนการliquefaction ให้มีประสิทธิภาพสูงขึ้น กระบวนการนี้แตกต่างจากกระบวนการเดิม คือจะแบ่งขั้นตอนการผลิตออกเป็น 2 ขั้นตอน ในขณะที่กระบวนการแบบเดิมมีเพียงขั้นตอนเดียว คือให้ความร้อนกับถ่านหินจนเกิดปฏิกิริยากับไฮโดรเจน

สำหรับกระบวนการแบบใหม่นั้นขั้นแรกจะหลอมถ่านหินโดยใช้ความร้อนและความกดดันสูง จนถ่านหินกลายเป็นน้ำมันที่มีความหนืดมาก เมื่อขจัดเอาขี้เถ้าและสิ่งปะปนต่าง ๆ ออกจากน้ำมันแล้ว ในขั้นที่ 2 จะให้ไฮโดรเจนเข้าทำปฏิกิริยากับน้ำมัน โดยใช้สารเร่งปฏิกิริยา (catalyst) น้ำมันที่ได้จะมีความใสและสะอาดมากขึ้น

การแบ่งกระบวนการliquefaction เป็น 2 ขั้นตอนนี้ทำให้สามารถเพิ่มประสิทธิภาพของแต่ละขั้นตอนได้ ขณะนี้ได้มีการทดลองใช้กระบวนการดังกล่าว กับถ่านหินบิทูมินัสของรัฐอิลลินอยส์ ซึ่งมีซัลเฟอร์สูงเช่นเดียวกับถ่านหินจากภาคตะวันตกกลางและภาคตะวันออก ของสหรัฐอเมริกา กระบวนการนี้สามารถผลิตเชื้อเพลิงสังเคราะห์ได้มากกว่ากระบวนการเดิมถึง 30% ต่อการใช้ไฮโดรเจนจำนวน 1 กิโลกรัม

International Power Generation 6,3 (April 1983): 9

การเพิ่มประสิทธิภาพของเซลแสงอาทิตย์

มีข่าวประกาศจากองค์การ NASAแห่งสหรัฐอเมริกาว่า การวิจัยและพัฒนาเพื่อผลิตกระแสไฟฟ้าโดยไม่ใช้สารกึ่งตัวนำ แต่ใช้เซลที่มีพลาสมอนฉาบที่พื้นผิวแทนจะได้รับความสำเร็จสูงมากทั้งในปัจจุบันและอนาคต

ขณะที่แสงอาทิตย์ตกกระทบพื้นผิวโลหะที่ขรุขระของเซลแสงอาทิตย์ชนิดนี้ พลาสมอนที่ฉาบไว้บนพื้นผิวเซล จะดูดพลังงานจากคลื่นแสงและเปลี่ยนเป็นคลื่นพลาสมานที่มีความเร็วสูงนำไปสะสมไว้แล้วจึงเปลี่ยนกลับมาเป็นพลังงานอีก

A.F.Forestieri หัวหน้าแผนกเทคโนโลยีเซลแสงอาทิตย์ของ NASA กล่าวว่า การผลิตกระแสไฟฟ้าด้วยวิธีนี้อาจมีประสิทธิภาพถึง 50%

แม้ว่าการศึกษาเซลแสงอาทิตย์ ของ NASA จะเน้นการใช้เซลนี้ในอวกาศ แต่ประสิทธิภาพ และความสามารถในด้านต่าง ๆ ของเซลที่ได้รับการพัฒนาขึ้นนี้ อาจนำไปสู่การพัฒนาเซลแสงอาทิตย์เพื่อใช้งานบนพื้นโลกต่อไป

ถ้าประสิทธิภาพ ของเซลแสงอาทิตย์เพิ่มขึ้นได้ถึง 3 เท่า เราก็สามารถลดพื้นที่ที่ต้องใช้ในการติดตั้ง และลดค่าใช้จ่ายในการใช้เซลแสงอาทิตย์ลงไปได้ ทำให้ระบบเซลแสงอาทิตย์แข่งขันกับแหล่งพลังงานอื่นๆได้

<u>International Power Generation</u> 6,3 (April 1983): 9.

<u>การใช้พลังงานสูญเปล่าทดน้ำเข้าทะเลทราย</u>

โครงการผลิตพลังงานจากแสงอาทิตย์คิงทุต (King Tut solar driven power generation project) ซึ่งเป็นโครงการร่วมระหว่างอังกฤษและอียิปต์ ดำเนินงานโดยทีมงานของสถาบันเทคโนโลยีแครนฟิลด์ เมืองเบดฟอร์ดไชร์ อังกฤษตะวันออก ได้ประสบความสำเร็จอย่างมาก ในการใช้ทั้งพลังงานจากแสงอาทิตย์ และพลังงานความร้อนสูญเปล่าจากโรงงานอุตสาหกรรมให้เป็นประโยชน์ โครงการระยะเวลา 2 ปีนี้ มีจุดมุ่งหมายเพื่อออกแบบและสร้างระบบสำเร็จรูป โดยใช้ความร้อนจากแสงอาทิตย์ ช่วยการชลประทานในภูมิภาคที่แห้งแล้ง ขณะนี้โครงการได้สิ้นสุดลงแล้ว และทีมงานของสถาบันเทคโนโลยีแครนฟิลด์ ได้ขนย้ายเครื่องมือไปยังเมืองเทนท์ ออฟ รามาดัน (Tenth of Ramadan) ซึ่งเป็นเมืองใหม่กลางทะเลทรายในประเทศอียิปต์ เพื่อติดตั้ง ทดลอง และปฏิบัติงาน

หลักการที่ใช้ในระบบนี้ต่างกับเทคนิคที่ใช้ในตู้เย็นตามบ้าน กล่าวคือ ตู้เย็นจะทำความ

เย็นโดยใช้ของไหล เช่น แอมโมเนีย ในการดูดกลืนความร้อน จากนั้นแอมโมเนียจะกลายเป็นไอ แล้วรวมตัวกันกลายเป็นของไหลดำเนินเป็นวงจรต่อเนื่องกันไปอีกครั้งหนึ่ง ส่วนในโครงการคิงทุตนี้ ความร้อนจากแสงอาทิตย์จะทำให้ฟรีออน (ของเหลวที่มีจุดเดือดต่ำมาก) กลายเป็นไอ จากนั้นจึงใช้ไอฟรีออนในการขับเคลื่อนคอมเพรสเซอร์หลายใบพัด (modified multi-vane compressor)หรือที่เรียกว่า Multi-vane Expander (MVE) เพื่อหมุนเครื่องสูบน้ำใช้ในการชลประทาน

ดร.พอล โอ คาลลาฮัน ผู้อำนวยการทีมงานแครนฟิลด์ กล่าวว่า MVE นี้ มีข้อดีหลายประการ คือ "สามารถใช้กับของไหลที่ใช้ในขบวนการทำความเย็นได้หลายชนิด โดยมีประสิทธิภาพคงที่ อีกทั้งใช้เวลาน้อยในการควบคุมเครื่อง ทำให้นำไปใช้กับอุปกรณ์ได้หลายชนิด เช่น เครื่องสูบน้ำ และเครื่องผลิตกระแสไฟฟ้า"

การเปลี่ยนฟรีออนให้เป็นไอนี้ เราใช้เครื่องสะสมความร้อนจากแสงอาทิตย์ เครื่องมือนี้ ประกอบด้วยหลอดสะสมความร้อนจากแสงอาทิตย์ (solar collector tube) ซึ่งมีลักษณะคล้ายหลอดไฟฟลูออเรสเซนต์ จำนวน 1,000 หลอด ติดตั้งเรียงรายทำมุมเอียง 30° แผ่นสะท้อนรูปเว้าทำด้วยอลูมิเนียม จะดูดพลังงานแสงอาทิตย์ มารวมที่แท่งสะสมความร้อน (heat pipe collector) ตรงกลางของแต่ละหลอด ความร้อนที่ได้จะถูกส่งไปยังท่อต้ม (boiler manifold) ทำให้ของไหลกลายเป็นไอไปขับเคลื่อนหมุนกังหัน MVE ได้

โอ คาลลาฮัน กล่าวว่า ระบบนี้ใช้เทคนิกง่าย และมีความยืดหยุ่นมาก จึงเหมาะสำหรับใช้กับเครื่องยนต์ดีเซล ในประเทศกำลังพัฒนา รวมทั้งยังเหมาะสำหรับประเทศที่พัฒนาแล้วอีกด้วย เพราะโรงงานอุตสาหกรรมในประเทศเหล่านี้มีความร้อนสูญเปล่ามาก แต่เดิมนั้นไม่มีผู้คิดนำความร้อนดังกล่าวมาใช้ประโยชน์ จนกระทั่งเชื้อเพลิงขึ้นราคาอย่างมาก ในช่วง 2-3 ปีที่ผ่านมานี้

Energy Management Technology 7,3 (April 1983): 10.

การผลิตไฟฟ้าโดยใช้ก๊าซจากขยะ

บริษัท Nippon Kokan K.K. ประเทศญี่ปุ่น ได้พัฒนาระบบการผลิตไฟฟ้าแบบใหม่ โดยใช้ขบวนการความร้อน ทำให้ขยะเข้มข้น (Thermal concentration process) ในถังย่อย และหมักขยะจนเกิดก๊าซมีเทนเพื่อใช้เป็นเชื้อเพลิงผลิตไฟฟ้าต่อไป

ในระบบการหมักขยะแบบเก่านั้น ขยะจะถูกทำให้เข้มข้นขึ้น โดยใช้แรงโน้มถ่วงดึงดูดให้ขยะตกลงมารวมกันในถังย่อยใบแรก จากนั้นจึงนำไปหมักในถังย่อยใบที่สอง แต่ในระบบใหม่นี้ ความร้อนจะช่วยทำให้ขยะส่วนนี้ไม่ตกตะกอนด้วยแรงโน้มถ่วงเพิ่มความเข้มข้นขึ้น ในถังย่อยใบแรกด้วย จากนั้นอินทรีย์วัตถุในขยะจะถูกทำให้เน่าเปื่อย และกลายเป็นก๊าซมีเทน ซึ่งจะถูกนำกลับไปใช้ในกระบวนการลอยตัว(floating) การแยกตัว(separating) การทำให้เข้มข้นขึ้น(concentrating) และการย่อยขยะแบบชีววิทยาต่อไป(biologically digesting)

การใช้ระบบใหม่นี้ ขยะซึ่งเคยทำให้เข้มข้นขึ้นได้เพียง 2-3% จะเพิ่มความเข้มข้นขึ้นเป็น 10% ฉะนั้นปริมาณของก๊าซที่เคยผลิตได้เพียง 0.6 ลูกบาศก์เมตร ก็เพิ่มขึ้นเป็น 1.3 ลูกบาศก์เมตรต่อน้ำหนักของอินทรีย์วัตถุ 1 กิโลกรัม และมีผลทำให้สามารถผลิตกระแสไฟฟ้าเพิ่มขึ้นจาก 1.2 กิโลวัตต์เป็น 2.4 กิโลวัตต์

<u>The Japan Industrial & Technological Bulletin</u> 11,2 (May 1983):29-30.

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สิงหาคม - กันยายน 2526

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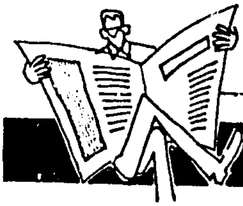
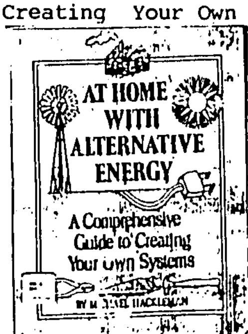


INTERESTING BOOKS

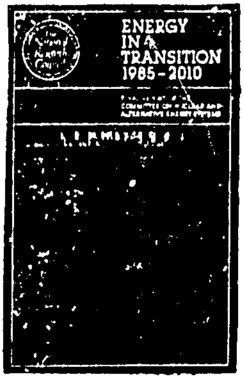
The following interesting titles which have been recently acquired are available at the NEIC library. Most of them consider world energy supplies in the foreseeable future, and discuss alternative/renewable energy sources as feasible solutions to energy shortages. Energy policies of certain countries that shed light on this are also included.

Hackleman, Michael. At Home with Alternative Energy : a Comprehensive Guide to Creating Your Own Systems. California : Peace Press, 1980.



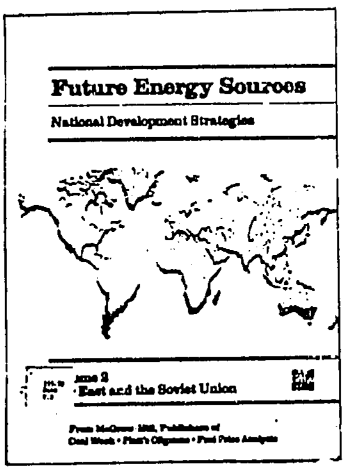
Looks at the five major alternative energy sources : Sun, Wind, Water, Wood and Methane ; and the systems which can be built to utilize them and which are adaptable to be created at home.

Energy in Transition 1985-2010 : Final Report of the Committee on Nuclear and Alternative Energy System. California : W.H.Freeman, 1980.



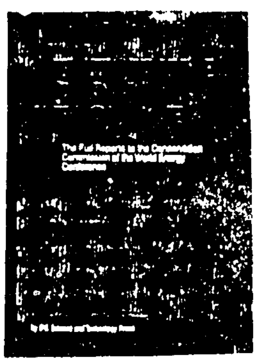
This report assesses the roles of alternative and nuclear energy systems in the period between 1985-2010. The opportunities to conserve energy are presented in some detail and the alternative energy technologies are analyzed as well as their associated risks and impacts. U.S. energy policy in the global economic and methods with analysis of this study projections are also given.

Future Energy Sources : National Development Strategies Volume 2 Far East and the Soviet Union. Washington : McGraw-Hill, 1982.



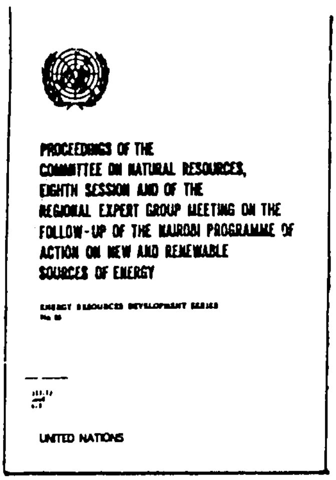
Edited and abridged versions of documents prepared by national governments for the United Nations Conference on New and Renewable Sources of Energy held in Kenya in 1981. The reports assess present energy supply and demand patterns in each country, outline policies and details of ongoing projects and development plans for renewable energy resources. The papers in this volume are Australia, Bangladesh, China, Indonesia, Japan, Soviet Union, Sri Lanka and Thailand.

Renewable Energy Resources. Guildford : IPC Science and Technology Press, 1978.



Reports the views of the world's main practitioners in the energy field on the prospects for world energy supply during the next four decades until 2020. The report is concerned with unconventional energy sources : solar (includes energy derived both directly and indirectly from solar), geothermal and fusion power.

Proceedings of the Committee on Natural Resources, Eighth Session and of the Regional Expert Group Meeting on the Follow-up of the Nairobi Programme of Action on New and Renewable Sources of Energy. New York : United Nations, 1982.



Consists of two parts. Part one includes the report and documents of the eighth session of the Committee on Natural Resources of the ESCAP held in Bangkok in 1981. Part two includes those of the Regional Expert Group Meeting on the Follow-up of the Nairobi Programme of Action on New and Renewable Sources of Energy held at Colombo in 1982. Each part is subdivided into 3 sections : report of the session, working papers presented by the secretariat, and information papers submitted by governments and interested parties.

ฐานข้อมูลบรรณานุกรม
แบบ on-line ทางด้านพลังงาน

เนื่องจากศูนย์ข้อมูลพลังงานแห่งประเทศไทยกำลังจัดทำฐานข้อมูลบรรณานุกรม และตัวเลขทางด้านพลังงาน จึงได้ศึกษาฐานข้อมูลอื่นๆ เพื่อเป็นแนวทางและเป็นแหล่งที่อาจติดต่อขอข้อมูลได้ในอนาคต ในจดหมายข่าวฉบับนี้ เราได้คัดเลือกรายชื่อตลอดจนรายละเอียดสั้นๆ เกี่ยวกับฐานข้อมูลบรรณานุกรมทางด้านพลังงานและด้านอื่นๆ ที่เกี่ยวข้องมาเสนอ ท่านอาจขอรับบริการแบบ off-line จากฐานข้อมูลเหล่านี้ได้ โดยเสียค่าบริการตามกำหนด

1. APILIT.(API LITERATURE)

Address : American Petroleum Institute
Central Abstracting and Indexing Service
156 William Street
New York, N.Y. 10038
USA

Subject fields: Petroleum, petroleum refining and petrochemicals, storage and transportation of petroleum products, and petroleum substitutes

On-line Service Supplier : ORBIT (File APILIT)

2. EDB (Energy Data Base)

Address : U.S. Dept of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830
USA

Subject fields : Energy, alternative fuels, business, conservation, engineering, environment, mining and metallurgy, nuclear science and physics

On-line Service Supplier : BRS (U.S. users only), ORBIT (U.S. users only), DIALOG (U.S. users only)

3. ENERGYLINE

Address: EIC/Intelligence (Environment Information Center, Inc.)
48 West 38th Street
New York, N.Y. 10018
USA

Subject fields: Energy, electric power transmission and storage, environmental impact, fuel production and transport, industrial, transportation and residential consumption, international political and economic issues, nuclear power, research and development, resources and reserves, solar energy, unconventional sources, U.S., policy and planning

On-line Service Supplier: BRS (File EICI), DIALOG (File 69), IRS (File 19), ORBIT (File ENERGYLINE)

4. CRRERIS

Address: Commonwealth Regional Renewable Energy Resources Information System c/o CSIRO

XVI

314 Albert Street

East Melbourne, Victoria 3002

Australia

Subject fields : Biomass/bioconversion, hydro power, ocean energy (thermal, tidal, wave), solar thermal energy, wind, geothermal power, solar general and other renewable energy sources in Australia, Bangladesh, Cook Islands, Fiji, India, Kiribati, Malaysia, Nauru, New Zealand, Niue, Papua New Guinea, Singapore, Solomon Islands, Sri Lanka, Tonga, Tarvalu, Vanuatu and Western Samoa

5. EBIB (Energy Bibliography and Index)

Address: Center for Energy and Mineral Resources

Texas A&M University Library

Reference Division

College Station, Texas 77843

USA

Subject fields: Energy-related materials : alternative energy sources, energy policy, energy storage and conversion, fuels, nuclear power, power plants and transmission. Extensive coverage on synthetic fuel technology

On-line Service Suppliers : ORBIT (File EBIB)

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November

4th Asia Pacific Water Supply Conference & Exhibition, Jakarta, Indonesia. Theme Mass provision of water supply in developing countries. 5 - 11, 1983.

Inter-Energy'83, Budapest, Hungary. 8 - 11, 1983.

1983 Eastern Oil Shale Symposium, Hyatt Regency, Lexington, Kentucky. 13 - 16, 1983.

Solar Energy Industries Association Annual Meeting, Phoenix, Arizona. 14 - 16, 1983.

Offshore East Asia '83 : Toivard Regional Cooperative Development of Seabed Petroleum Resources, Hong Kong. 14 - 17, 1983.

Coal technology '83, the Sixth International Coal & Lignite Utilization Exhibition & Conference, Astrohall, Houston, Texas. 15 - 17, 1983.

Second Meeting of the World Congress Alternatives and Environment, Tel Aviv, Israel 20 - 25, 1983.

Sixth World Energy Engineering Congress, Atlanta, Georgia. Nov 30 - Dec 2, 1983.

December

2nd Miami Symposium on Solar Energy & Conservation, Miami Beach, Florida. 12 - 14, 1983.

Sixth Miami International Conference on Alternative Energy Sources, Miami Beach, Florida. 12 - 14, 1983.

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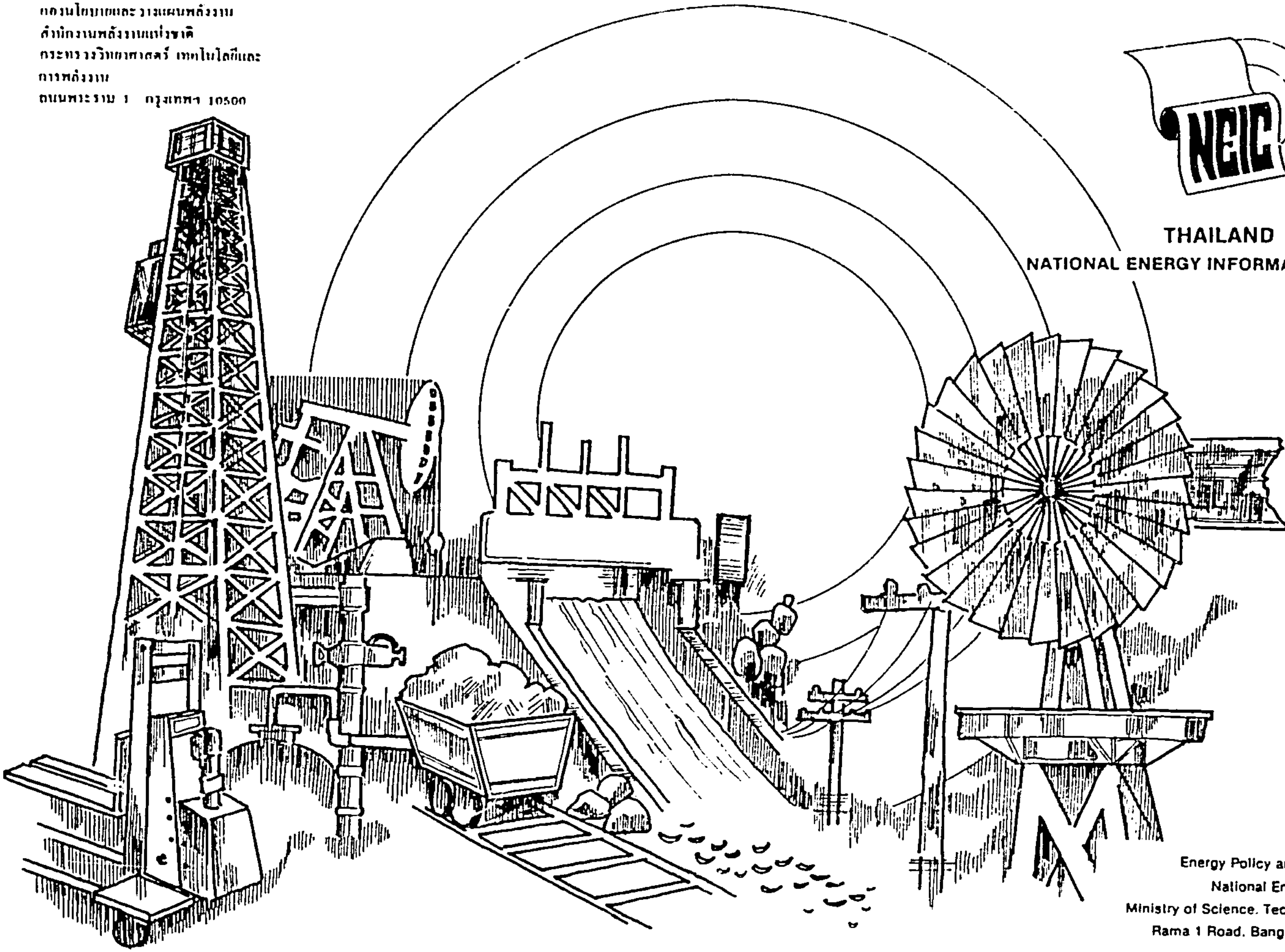
กองนโยบายและวางแผนพลังงาน
สำนักงานพลังงานแห่งชาติ
กระทรวงวิทยาศาสตร์ เทคโนโลยีและ
การพลังงาน
ถนนพระราม 1 กรุงเทพฯ 10500



THAILAND
NATIONAL ENERGY INFORMATION CENTER

Annex XVII

Energy Policy and Planning Division
National Energy Administration
Ministry of Science, Technology and Energy
Rama 1 Road, Bangkok 10500, Thailand

THE DATA BASE

The NEIC is an online data base in energy. It is a collection of bibliographical and numerical records made available and searchable through a computer terminal.

It is a referral center that offers users a way of obtaining up-to-date literature in energy.

At present the files contain over 2,500 bibliographic records and 1,500,000 numerical records dealing with relevant and timely topics in energy. These are selected monthly from published documents and from first-hand field surveys and projects.

THE LIBRARY

The NEIC maintains a collection of materials on the following disciplines

- Renewable and alternative energy sources
- Petroleum
- Energy policy, conservation, consumption, supply and demand
- Statistics on energy resources in Thailand

PUBLICATIONS

The NEIC issues regularly, in Thai, a newsletter titled 'NEIC News'. It is distributed free of charge, and covers renewable energy in Thailand as well as activities of the NEIC. From the data base, bibliographies are issued based on user demand. The numerical data base also produces annual statistical tables on energy resources, electricity and petroleum imports, consumption, supply and demand.

SERVICES

AT MINIMAL CHARGES

- Photocopying and microfiche printing
- Online services on the premises
- Offline citations (per citation)
- Customized services

MON - FRI 8:30 a.m. - 12:00 noon, 1.00 p.m. - 4.30 p.m.

Non-NEA users may borrow through inter-library loans, and may reguest

Searches from the data bases.

ADDRESS

National Energy Information Center
Energy Policy and Planning Division
National Energy Administration
Rama 1 Rd., Bangkok 10500, Thailand
Tel. 2210139, 2230021 ext. 203

ฐานข้อมูล

ศูนย์ข้อมูลพลังงานแห่งประเทศไทยจัดตั้งขึ้นเพื่อเป็นฐานข้อมูลแบบ online ทางด้านพลังงาน และเป็นศูนย์กลางอ้างอิงให้บริการข้อมูลด้านพลังงานที่ทันสมัย โดยใช้เครื่องคอมพิวเตอร์ในการเก็บและให้ข้อมูลด้านบรรณานุกรม และด้านตัวเลข

ขณะนี้ศูนย์ข้อมูลฯ มีข้อมูลด้านบรรณานุกรมมากกว่า 1,000 ชิ้น และข้อมูลด้านตัวเลขอีก 1,500,000 ชิ้น และจะเพิ่มขึ้นเรื่อย ๆ โดยคัดเลือกและรวบรวมเป็นประจำทุกเดือนจากสิ่งพิมพ์และจากการสำรวจภาคสนามและจากเอกสารโครงการต่าง ๆ

ห้องสมุด

ห้องสมุดของศูนย์ข้อมูลฯ รวบรวมสิ่งพิมพ์ตามหัวข้อต่อไปนี้

- แหล่งพลังงานหมุนเวียนและพลังงานทดแทน
- ปิโตรเลียม
- นโยบายพลังงาน รวมทั้งการประหยัดพลังงาน การบริโภค อุปสงค์และอุปทาน
- สถิติเกี่ยวกับแหล่งพลังงานในประเทศไทย

สิ่งพิมพ์

ศูนย์ข้อมูลฯ ได้จัดทำ "จดหมายข่าวศูนย์ข้อมูลพลังงานแห่งประเทศไทย" ออกเป็นประจำโดยมีเนื้อหาเน้นหนักเรื่องพลังงานหมุนเวียนในประเทศไทย และกิจกรรมของศูนย์ข้อมูลฯ จดหมายข่าวนี้แจกแก่ผู้สนใจโดยไม่คิดมูลค่า นอกจากนี้ศูนย์ข้อมูลฯ ยังได้จัดทำบรรณานุกรมตามหัวข้อที่มีผู้สนใจ และจัดพิมพ์ข้อมูลด้านตัวเลขเป็นตารางสถิติประจำเกี่ยวกับการสั่งเข้า การบริโภค อุปสงค์และอุปทานของพลังงานในรูปแบบต่าง ๆ รวมทั้งพลังงานไฟฟ้าและปิโตรเลียม

การบริการ

ห้องสมุดเรียกเก็บค่าบริการจากบริการต่อไปนี้

- การถ่ายเอกสารและการพิมพ์ภาพจากไมโครฟิช
- บริการ online (ต่อระยะเวลาที่ใช้บริการ)
- บริการ offline citations (ต่อเรื่อง)
- บริการพิเศษตามความต้องการของผู้ใช้

ห้องสมุดเปิดบริการในวันจันทร์ถึงวันศุกร์ (ยกเว้นวันหยุดราชการ) ตั้งแต่เวลา 8.30 น.-12.00 น. และ 13.00 น.-16.30 น. กรณีที่ผู้ใช้บริการไม่ได้สังกัดสำนักงานพลังงานแห่งชาติอาจขอยืมหนังสือจากห้องสมุดได้โดยใช้บริการยืมระหว่างห้องสมุด

อาจขอยืมหนังสือจากห้องสมุดได้โดยใช้บริการยืมระหว่างห้องสมุด

ที่ตั้ง

ศูนย์ข้อมูลพลังงานแห่งประเทศไทย
กองนโยบายและวางแผนพลังงาน สำนักงานพลังงานแห่งชาติ
ถนนพระราม 1 กรุงเทพฯ 10500 โทร.2210139, 2230021 ต่อ 203

Annex XVIII

Questionnaire for Directory of Energy Information Centers

1. Name and acronym (If applicable) of center:

2. Objectives of center:

3. Postal address:

   Tel. No.:
   Cable:
   Telex:

4. Person to contact:

   Position:

5. Type of center (You may tick more than one):

   ---- National/Government organization
   ---- Public enterprise
   ---- Information center
   ---- Library (traditional)
   ---- Professional organization/Research center
   ---- Industrial organization/Company

   N.B. Item 6 and 7 are very relevant to our project which will help to enhance our role as an energy information referral center in Bangkok. We do appreciate your taking the time to fill them up. Thank you.

6. Subject coverage (You may tick more than one):

		Research carried out
Oil and petroleum	-----	-----
Coal	-----	-----
Nuclear	-----	-----
Hydro	-----	-----
Solar	-----	-----
Wind	-----	-----
Geothermal	-----	-----
Biomass/Biogas	-----	-----
Appropriate technology	-----	-----
Energy planning	-----	-----
Energy conservation	-----	-----
Draught animal power	-----	-----
Others (Please specify)	-----	-----

7. Publications issued:

----- Research papers (If possible, include latest lists)
----- Journal (Please specify the title)

----- Newsletter (Please specify the title)

----- Brochure (Please mail one copy)
----- Bibliographies (Please specify the title)

----- Others (Please specify)

8. Services:

----- Library loans
----- Data bases services

    ----- Searches
    ----- SDI (Selective Dissemination of Information)
    ----- Others (Please specify)

----- Photocopying services
----- Others (Please specify)

9. User restrictions:

----- Yes
----- No

Annex XIX

(Library Handbook for Users)

คู่มือการใช้ห้องสมุด

ศูนย์ข้อมูลพลังงานแห่งประเทศไทย

กองนโยบายและวางแผนพลังงาน
สำนักงานพลังงานแห่งชาติ
กระทรวงวิทยาศาสตร์ เทคโนโลยี และการพลังงาน
ถนนพระราม 1 กรุงเทพ ฯ 10500

คู่มือการใช้ห้องสมุด

ศูนย์ข้อมูลพลังงานแห่งประเทศไทย

กองนโยบายและวางแผนพลังงาน
สำนักงานพลังงานแห่งชาติ
กระทรวงวิทยาศาสตร์ เทคโนโลยี และการพลังงาน
ถนนพระราม 1 กรุงเทพ ฯ 10500

สารบาญ

คู่มือการใช้ห้องสมุดศูนย์ข้อมูลพลังงานแห่งประเทศไทย

คำนำ

ห้องสมุดศูนย์ข้อมูลพลังงานแห่งประเทศไทย เป็นงานหนึ่งอยู่ใน ศูนย์ข้อมูลพลังงานแห่งประเทศไทย กองนโยบายและวางแผนพลังงาน สำนักงานพลังงานแห่งชาติ วัตถุประสงค์ของห้องสมุด คือ รวบรวมเอกสารสิ่งพิมพ์และวัสดุทางด้านพลังงาน เพื่อสนับสนุนฐานข้อมูลของศูนย์ข้อมูลพลังงานแห่งประเทศไทย และสำหรับใช้ประโยชน์ในการศึกษาค้นคว้าวิจัยและอ้างอิงของข้าราชการและเจ้าหน้าที่ของสำนักงานพลังงานแห่งชาติ ตลอดจนสถาบันและบุคคลทั่วไปที่สนใจ คู่มือฉบับที่ท่านถืออยู่นี้มีจุดประสงค์เพื่อแนะนำเอกสารสิ่งพิมพ์และวัสดุ รวมทั้งบริการของห้องสมุด หากท่านมีปัญหาและต้องการความช่วยเหลือทางด้านข้อมูล โปรดติดต่อเจ้าหน้าที่ของห้องสมุดศูนย์ข้อมูลฯ

ที่ตั้ง

ห้องสมุดศูนย์ข้อมูลพลังงานแห่งประเทศไทย ตั้งอยู่บริเวณชั้นล่างของกองนโยบายและวางแผนพลังงาน สำนักงานพลังงานแห่งชาติ ถนนพระราม 1 กรุงเทพฯ 10500

เวลาทำการ

วันจันทร์ ถึง วันศุกร์ เวลา 8.30 น. - 12.00 น. และ 13.00 น. - 16.30 น.

1

เอกสารสิ่งพิมพ์และวัสดุ

ห้องสมุดศูนย์ข้อมูลฯ รวบรวม จัดระเบียบ และให้บริการเอกสารสิ่งพิมพ์และวัสดุทั้งภาษาไทยและภาษาอังกฤษ โดยเน้นหนักในหัวข้อต่อไปนี้

- แหล่งพลังงานหมุนเวียน
- การจัดการและนโยบายทางด้านพลังงาน
- น้ำมันและก๊าซธรรมชาติ
- การประหยัดพลังงาน
- พลังงานที่เหมาะสมในชนบท

เอกสารสิ่งพิมพ์และวัสดุของห้องสมุด อาจแยกออกได้ดังนี้

1. หนังสือ ตำรา รายงานการประชุมที่อยู่ในรูปของสิ่งพิมพ์ จัดเรียงไว้ตามเลขหมู่ทศนิยมของดิวอี้บนชั้นหนังสือ ส่วนพวกที่อยู่ในรูปของไมโครฟิชจะเรียงตามเลขหมู่เช่นเดียวกันในตู้เก็บไมโครฟิช ทั้งนี้เพื่อให้หนังสือที่มีเนื้อหาเดียวกันหรือเกี่ยวข้องกัน อยู่รวมกลุ่มเพื่อสะดวกในการค้นหา

2. หนังสืออ้างอิง ได้แก่ สารานุกรม พจนานุกรม นามานุกรม คู่มือ เป็นต้น หนังสือเหล่านี้เรียงตามเลขหมู่ทศนิยมของดิวอี้พร้อมกับมีตัวอักษร " R " หรือ " อ " บ่งให้รู้ว่าเป็นหนังสืออ้างอิง จัดเรียงไว้บนชั้นในกลุ่มหนังสืออ้างอิงโดยเฉพาะ หนังสือพวกนี้ไม่อนุญาตให้ยืมออกจากห้องสมุด

3. รายงานของโครงการที่สำนักงานพลังงานแห่งชาติดำเนินงาน จัดเรียงไว้ในตู้

เก็บในโครพิชตามหมายเลขที่ห้องสมุดกำหนดให้

4. หนังสือรายงานการศึกษาภาวะเศรษฐกิจอุตสาหกรรมเฉพาะประเภท จัดเรียงตามหมายเลขที่ห้องสมุดกำหนดให้ในกล่องเหล็กจุลสารซึ่งวางเรียงบนชั้นหนังสือ

5. หนังสือมาตรฐาน International Electrotechnical Commission-(IEC) จัดเรียงลำดับตามหมายเลขของหนังสือในตู้เก็บเอกสาร

6. หนังสือมาตรฐานอุตสาหกรรม (มอก.) จัดเรียงตามหมายเลขของ มอก.-ในกล่องเหล็กจุลสาร ซึ่งวางเรียงบนชั้นหนังสือ

7. วารสารเล่มปัจจุบัน เรียงไว้ตามตัวอักษรของชื่อเรื่องบนชั้นวารสาร ส่วนวารสารล่วงเวลา เรียงไว้ตามตัวอักษรของชื่อเรื่องและตามปีที่พิมพ์ บนชั้นหนังสือ

8. จุลสารและกฤตภาค รวมทั้งเอกสารเผยแพร่งานของบริษัทต่างๆ จัดเรียงตาม-ตัวอักษรของหัวเรื่องและชื่อบริษัทในตู้เก็บจุลสาร

วิธีค้นหาหนังสือและวัสดุ

ห้องสมุดศูนย์ข้อมูลฯ ได้จัดทำบัตรรายการเพื่อช่วยผู้ใช้ค้นหาหนังสือและวัสดุได้โดยสะดวก บัตรรายการนี้แยกออกเป็น 3 ประเภท คือ

บัตรผู้แต่ง

บัตรชื่อเรื่อง

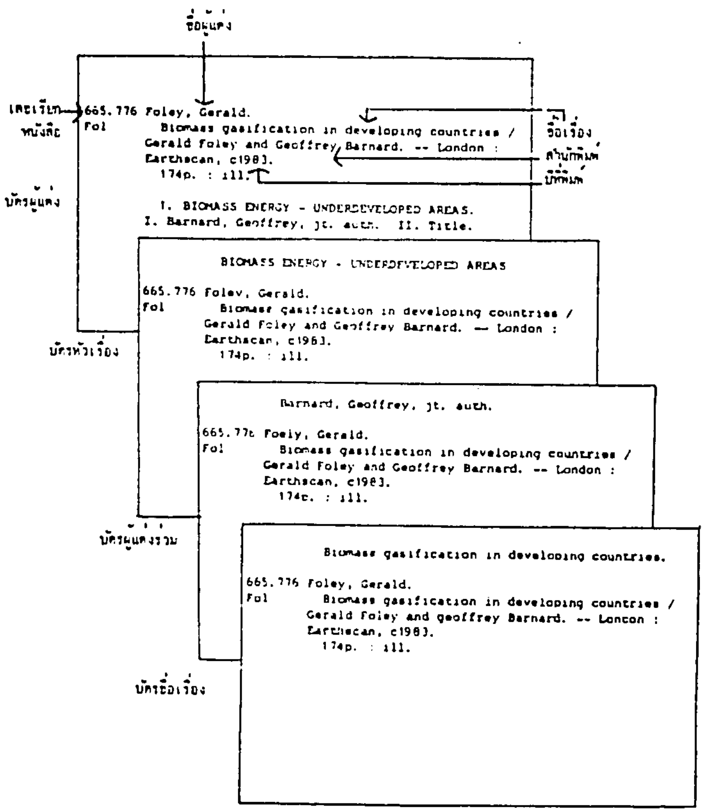
บัตรหัวเรื่อง

บัตรแต่ละประเภท จะเรียงลำดับตามตัวอักษร หนังสือและวัสดุโดยทั่วไปจะมีบัตรพื้นฐาน-อย่างน้อยที่สุด 3 บัตรดังกล่าว และอาจมีบัตรเพิ่มอื่นๆ เช่น บัตรผู้แต่งร่วม บัตรผู้รวบ-

รวม บัตรบรรณาธิการ เป็นต้น นอกจากนี้ห้องสมุดยังมีบัตรรายการชนิดอื่น ๆ อีก ดังตัวอย่างที่จะแสดงต่อไปนี้

ตัวอย่างบัตรรายการ

บัตรรายการหนังสือทั่วไป



บัตรรายการหนังสือที่อยู่ในรูปของไมโครฟิช

MF
333.82273 Zawadzki, Edward A.
Zaw Study of U.S. coal resources, markets, and transportation. -- Springfield, Va. : National Technical Information Service, 1981.
2 microfiches (106 fr.) ; 10 x 15 cm.

1. COAL -- UNITED STATES. I. United States of America. National Technical Information Service II. Title.

ไฮโปคลอไรท์
มอก.225-2520 มาตรฐานผลิตภัณฑ์อุตสาหกรรม ไฮโปคลอไรท์

บัตรรายการหนังสือมาตรฐานผลิตภัณฑ์อุตสาหกรรม

5

บัตรรายการหนังสือรายงานการศึกษาภาวะ
เศรษฐกิจอุตสาหกรรมเฉพาะประเภท

<u>แอลกอฮอล์</u>

29 อุตสาหกรรม, กระทรวง. กองเศรษฐกิจอุตสาหกรรม.
รายงานการศึกษาภาวะเศรษฐกิจอุตสาหกรรมเฉพาะประเภท
"อุตสาหกรรมแอลกอฮอล์". — กรุงเทพฯ, 2524.

ε

วิธีค้นหาวารสาร

ห้องสมุดศูนย์ข้อมูลฯ มีตู้ทะเบียนวารสารสำหรับผู้ใช้ เพื่อตรวจสอบรายชื่อวารสาร และฉบับที่มีในห้องสมุด นอกจากนี้ห้องสมุดยังมีบัตรดรรชนีวารสารภาษาไทยสำหรับใช้ค้นหาหัวเรื่องที่ต้องการในวารสารภาษาไทย โดยบัตรเหล่านี้จะเรียงตามตัวอักษรของหัวเรื่องในตู้บัตรรายการ "ดรรชนีวารสารภาษาไทย" ส่วนวารสารภาษาอังกฤษ ห้องสมุดมีกระดาษแสดงผลข้อมูลจากเครื่องคอมพิวเตอร์ สำหรับค้นบทความที่ต้องการ

7

บริการแก่ผู้อ่าน

การยืมเอกสารและสิ่งพิมพ์

1. ผู้มีสิทธิยืมเอกสารและสิ่งพิมพ์

    1.1 ข้าราชการและเจ้าหน้าที่ของสำนักงานพลังงานแห่งชาติ

    1.2 บรรณารักษ์หรือเจ้าหน้าที่ของหน่วยงานอื่นๆ ซึ่งยืมตามระเบียบการยืมระหว่างห้องสมุด

    1.3 บุคคลอื่น ๆ ซึ่งได้รับความยินยอมจากผู้อำนวยการกองนโยบายและวางแผนพลังงาน บุคคลผู้มีชื่ออยู่ในบัตรยืมของหนังสือที่ถูกยืมออกไป จะถือว่าเป็นผู้รับผิดชอบหนังสือเล่มนั้น

2. กำหนดเวลาการยืม

    เอกสารและสิ่งพิมพ์ทุกประเภท ยืมได้ครั้งละไม่เกิน 2 สัปดาห์ยกเว้นหนังสืออ้างอิง ไมโครฟิช ไม่อนุญาตให้ยืม

3. การต่ออายุการยืม

    ผู้ยืมเอกสารและสิ่งพิมพ์อาจต่ออายุการยืมหลังจากครบกำหนดเวลายืมแล้วได้ในกรณีที่ยังใช้เอกสารและสิ่งพิมพ์ไม่เสร็จ โดยให้ยืมต่อ ตามกำหนดเวลาการยืมข้างต้น ห้องสมุดจะให้ยืมเอกสารและสิ่งพิมพ์ต่อได้ โดยไม่กำหนดครั้ง เว้นแต่กรณีที่มีผู้จองเอกสารและสิ่งพิมพ์นั้นเพื่อยืมต่อแล้ว

๘

4. การยืมในกรณีพิเศษ

ในกรณีที่มีผู้ต้องการใช้เอกสารและสิ่งพิมพ์เล่มใดนานเป็นพิเศษเพื่อใช้ประกอบการศึกษา ค้นคว้าวิจัยในเรื่องใดเรื่องหนึ่ง ให้ทำหนังสือขออนุญาตการยืมจากผู้อำนวยการกองนโยบายและวางแผนพลังงาน ทั้งนี้เอกสารและสิ่งพิมพ์ดังกล่าวยืมได้ตั้งแต่ 1 เดือนขึ้นไป แต่ต้องไม่เกิน 3 เดือนต่อครั้งที่ขออนุญาต

5. จำนวนเอกสารและสิ่งพิมพ์ที่ยืมได้

ห้องสมุดให้ยืมเอกสารและสิ่งพิมพ์ได้คราวเดียวกันไม่เกิน 7 เล่ม

เอกสารและสิ่งพิมพ์ที่ยืมเกินกำหนดเวลา

1. ห้องสมุดจะส่งใบเตือนไปยังผู้ยืมครั้งแรกภายในระยะเวลา 15 วัน นับตั้งแต่วันยืมสิ้นสุดลง

2. ห้องสมุดจะส่งใบเตือนไปยังผู้ยืมครั้งที่สองภายใน 20 วัน นับแต่วันส่งใบเตือนครั้งแรก

3. หากผู้ยืมไม่ส่งเอกสารและสิ่งพิมพ์ที่ยืมไปจากห้องสมุดภายใน 60 วัน นับแต่วันกำหนดยืมสิ้นสุดลง ห้องสมุดจะถือเสมือนว่าเอกสารสิ่งพิมพ์นั้น ๆ สูญหาย

4. หากผู้ยืมทำเอกสารและสิ่งพิมพ์สูญหาย หรือเสื่อมสภาพไปจนผู้อื่นใช้ต่อไม่ได้ ผู้ยืมจะต้องจัดหาเอกสารและสิ่งพิมพ์ในชื่อเดียวกันกับที่สูญหายหรือถูกทำลายมาใช้แทน ในกรณีที่ผู้ยืมไม่สามารถจัดหาเอกสารและสิ่งพิมพ์มาได้ ผู้ยืมจะต้องชดใช้เงินกับห้องสมุดตามราคาเอกสารและสิ่งพิมพ์นั้น ๆ ในปัจจุบันรวมทั้งค่าส่งสำหรับเอกสารและสิ่งพิมพ์ ที่ไม่

๑

สามารถหาซื้อได้อีกในปัจจุบัน ผู้ยืมจะต้องชดใช้ค่าเอกสารและสิ่งพิมพ์นั้น ๆ ตามราคาเดิม ทั้งนี้การชดใช้ค่าเอกสารสิ่งพิมพ์ จะทำได้โดยให้กองคลังและพัสดุหักเงินเดือน ผู้นั้น

บริการถ่ายเอกสารจากเครื่องถ่ายเอกสาร

1. ห้องสมุดศูนย์ข้อมูลฯ บริการถ่ายเอกสารจากเอกสารและสิ่งพิมพ์ของห้องสมุดแก่บุคคลภายนอกทั่วไป โดยคิดค่าบริการอัตราหน้าละ 1 บาท ย่อและขยายหน้าละ 1.50 บาท

2. ข้าราชการและเจ้าหน้าที่ของสำนักงานพลังงานแห่งชาติ ที่ต้องการถ่ายเอกสารจากเอกสารและสิ่งพิมพ์ของห้องสมุดเพื่อใช้ประกอบการปฏิบัติงานของข้าราชการ ไม่ต้องเสียค่าบริการในการถ่ายเอกสาร

บริการเครื่องอ่านและพิมพ์ภาพไมโครฟิช

1. ห้องสมุด ให้บริการใช้เครื่องอ่านไมโครฟิช โดยไม่คิดค่าบริการใด ๆ ทั้งสิ้น

2. ในกรณีที่ผู้ใช้ต้องการพิมพ์ภาพจากแผ่นไมโครฟิช ห้องสมุดจะคิดค่าบริการแผ่นละ 5 บาท สำหรับบุคคลภายนอก และไม่คิดค่าบริการสำหรับข้าราชการและเจ้าหน้าที่ของสำนักงานพลังงานแห่งชาติ

บริการอ้างอิง

ผู้ที่มีปัญหาในการใช้บริการของห้องสมุดศูนย์ข้อมูลฯ โปรดติดต่อสอบถามเจ้าหน้าที่ ของห้องสมุด โดยจะติดต่อด้วยตนเอง หรือทางโทรศัพท์ 203 (ภายใน) และ 221-0139,

10

223-6223 (ภายนอก)

บริการยืมระหว่างห้องสมุด

1. ห้องสมุดจัดบริการยืมระหว่างห้องสมุดสำหรับข้าราชการและเจ้าหน้าที่ของสำนักงานพลังงานแห่งชาติที่ต้องการเอกสารและสิ่งพิมพ์ซึ่งไม่มีในห้องสมุด โดยมีแบบฟอร์มการยืมระหว่างห้องสมุดให้ แต่ผู้ใช้จะต้องนำแบบฟอร์มไปติดต่อยืมด้วยตนเอง

2. ในกรณีกลับกัน ห้องสมุดก็มีบริการยืมระหว่างห้องสมุดให้แก่ผู้ใช้จากหน่วยงานอื่น โดยใช้แบบฟอร์มการยืมระหว่างห้องสมุดของหน่วยงานนั้น ๆ ห้องสมุดอนุญาตให้ผู้ใช้จากหน่วยงานอื่นยืมเอกสารและสิ่งพิมพ์ทุกชนิด ยกเว้น หนังสืออ้างอิง หนังสือปกปิด และวารสาร

บริการข้อมูลที่เลือกสรร

1. บริการข่าวสารทันสมัย ห้องสมุดมีบริการส่งหน้าสารบาญที่ถ่ายเอกสารจาก วารสารและหนังสือใหม่ ไปยังผู้สนใจ

2. บริการรวบรวมบรรณานุกรม ห้องสมุดมีบริการรวบรวมบรรณานุกรมตามความต้องการของผู้ใช้ โดยดึงข้อมูลจากฐานข้อมูลของศูนย์ข้อมูลฯ นอกจากนี้ห้องสมุดยังมี กระดาษแสดงผลข้อมูลจากเครื่องคอมพิวเตอร์ในหัวข้อต่างๆ ทางด้านพลังงานของฐานข้อมูล ESCAP และ AIT ด้วย

3. สิ่งพิมพ์ ห้องสมุดได้ส่งรายชื่อหนังสือใหม่ทั้งภาษาไทยและภาษาอังกฤษ รวมทั้งดรรชนีวารสารภาษาไทยลงไปใน "จดหมายข่าวศูนย์ข้อมูลพลังงานแห่งประเทศไทย" ซึ่ง

11

ออกเป็นประจำทุก 3 เดือน

ระเบียบการใช้ห้องสมุดศูนย์ข้อมูลฯ

1. ผู้ใช้ทุกคน ต้องลงชื่อเข้าใช้ห้องสมุดทุกครั้ง ในสมุดลงทะเบียนตรงทางเข้าออกห้องสมุด

2. ห้ามนำอาหารและเครื่องดื่มเข้ามาในบริเวณห้องสมุด

3. ห้ามสูบบุหรี่ในห้องสมุด โดยเด็ดขาด

4. เมื่อนำเอกสารและสิ่งพิมพ์ออกมาอ่านแล้ว โปรดวางไว้บนโต๊ะอ่านหนังสือ ไม่ต้องนำไปเก็บที่ชั้น เจ้าหน้าที่ของห้องสมุดจะเป็นผู้นำไปจัดเรียงเองทั้งนี้เพื่อความสะดวกเรียบร้อยในการค้นหาและจัดเก็บในโอกาสต่อไป

5. ห้องสมุดเป็นบริเวณที่ต้องการความเงียบ จึงขอความกรุณาผู้ใช้ทุกท่านเกรงใจผู้อื่น หลีกเลี่ยงการใช้เสียงดังในห้องสมุด

Annex XX

NEIC / BIB / 2 / 1
November 1983

National Energy Information Center
Energy Bibliographies 1983

Energy in Thailand
Selected References

National Energy Information Center
Energy Policy and Planning Division
National Energy Administration
Rama 1 Rd., Bangkok 10500
Thailand
Tel. 2210139

Contents

Introduction

The National Energy Information Center (NEIC) is a department of the National Energy Administration. The purpose of this Center is to collect, organize and disseminate energy information on the following topics :

Alternative sources of energy
- Coal
- Nuclear

Conservation of energy
Energy policy and management
Oil and natural gas
Renewable sources of energy
- Biomass energy
- Geothermal energy
- Hydropower
- Solar energy
- Wind energy

At present, the Center has a modest data base which it began in December 1982 and which currently stored in the ESCAP Bibliographic Information System (EBIS). In the future the NEIC will have its own computer system. A major function of the Center is to issue bibliographies on relevant topics for researchers and interested parties.

The citations in this bibliography on energy in Thailand have been selected from the above-mentioned data base. In an effort to centralize energy information, the NEIC has included references on the subject from the Asian Institute of Technology (AIT) - Library Resources Documentation Center and Economic And Social Commission for Asia and the Pacific (ESCAP) Library, in addition to its own.

The arrangement of this bibliography is by subject, under which the titles are listed alphabetically. Keywords and abstracts are included.

All NEIC documents must be used on the premises except under inter-library loan arrangements. Photocopying services are available at a minimal charge.

Other bibliographies in the series include :

Energy in Thailand - Selected References. NEIC/BIB/1/1 (in English)
Energy Serials (English and Thai). NEIC/BIB/1/2 (in English and Thai)
Energy Articles from Thai Serials. NEIC/BIB/1/3 (in Thai)

COAL AND COAL PRODUCTS

1. Research and development into lignite energy conversion process by the Department of Chemical Engineering Chulalongkorn University

Praserthdam, Piyasan
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning
p.274-284 : diag., tables
COAL/ LIGNITE/ THAILAND

Proven lignite reserves in Lampang province are 120 million tons. Electricity is generated using a pulverized bed combustion which has disadvantages. Research and experiments are discussed on changing to fluidized bed combustion.
333.7917 EneU
NEIC

2. Utilization of coal and lignite for the generation of electricity in Thailand

Jhotirungsiyakorn, Chai-Asa and Artthayukti, Woraphat
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning
p.302-313 : tables
COAL/ LIGNITE/ ELECTRIC POWER/ THAILAND

XX

80-90 percent of the mined lignite is used in electricity generation. Its high ash content, high moisture, high volatile matter and low heat value are major disadvantages.
333.7917 EneU
NEIC

ELECTRIC POWER

3. Allocation of electricity cost

Akkawat, Warinee
Thammasat University. Faculty of Economics
Bangkok
Thammasat University
1981
x, 156p.
ELECTRICITY/ COST ANALYSIS/ PRICING/ THAILAND/ CASE STUDIES

A study on the marginal-cost pricing of the Electricity Generating Authority of Thailand based on the 1980 data.
338.585:621.3(593) Akk
ESCAP

4. Development of electricity systems in provincial areas of Thailand

Pracha Thitathan
From: Proceedings of the Seminar and Study Tour on Electricity...
p.80-82
ELECTRICITY/ POWER DISTRIBUTION/ THAILAND

A X(5-012):620.9 Uni No.18
ESCAP

5. EGAT : keeping its options open

McCulloch, Russell
From: Business in Thailand
13(5):62-73
May 1982
ELECTRIC POWER PLANTS/ THAILAND

EGAT has announced a reduction in the price of electricity for average households. Article discusses EGAT's problem in getting fuel for power generation. Focus is given on energy planning and policy making.
NEIC

6. EGAT's flexibility

From: Business in Thailand
13(5):74-75
May 1982
ELECTRIC POWER PLANTS/ COAL/ THAILAND

Interview with EGAT general manager discusses lignite, oil and energy.
NEIC

7. Electricity pricing : theory and case studies

Munasinghe, Mohan and Warford, Jeremy J.
World Bank
Baltimore; Md.
Johns Hopkins University Press
1982
xviii, 381p.
ELECTRIC POWER/ PRICING/ SOUTH EAST ASIA/ INDONESIA/ PAKISTAN/ PHILIPPINES/ SRI LANKA/ THAILAND

Contains a summary of the economic principles underlying marginal cost pricing for electric power. Emphasizes the importance of the adjustments to reflect the various economic, social and engineering objectives and constraints. Includes case studies in five developing countries in Asia and two seminars conducted by the World Bank.

333.585:621.3(5-012) Mun

ESCAP

8. The feasibility of producer gas in electricity generation

Coovattanachai, Naksitte ; Chongcharoen, Witaya and Koopatararnond

From: Renewable energy review journal

4(2):71-88

Dec 1982

ELECTRICITY/ THAILAND

Experiments carried out on use of producer gas for internal combustion engines for local electricity generation. Technical feasibility is considered in article.

NEIC

9. Planning of bulk power supply for the greater Bangkok area

Somkiet Phaloprakarn

From: Proceedings of the Seminar and Study Tour on Electricity...

p.78-80

ELECTRICITY/ POWER DISTRIBUTION/ THAILANI

A X(5-012):620.9 Uni No.16

ESCAP

10 Planning,significant trends and problems of the Metropolitan Electricity Authority s distribution system

Anan Atilaksana

From: Proceedings of the Seminar and Study Tour on Electricity...

p 74 78

ELECTRICITY ELECTRIC POWER/ POWER DISTRIBUTION/ THAILAND

A X(5-012):620.9 Uni No.18

ESCAP

11 Programme and problems in Provincial Electricity Authority (PEA) responsible area

Surak

From: Proceedings of the Workshop on Biogas...

P.131-132

RURAL ELECTRIFICATION/ THAILAND

A X(5-012):620.9 Uni No.19*620.9(5-012) Uni

ESCAP

12. Regulation, policy and development of electric power in Thailand

Itthi Bijayendrayodhin

From: Proceedings of the Seminar and Study Tour on Electricity...

p.83-84

ELECTRICITY/ POWER DISTRIBUTION/ THAILAND

A X(5-012):620.9 Uni No.18

ESCAP

13. A 75 MW barge mounted power station, built in Japan and operating in Thailand

From: International power generation

5(1):32-33

Feb 1982

POWER PLANTS/ THAILAND

A 75 MW base load utility power plant, barge mounted, has completed its first year's operation in Thailand. It was designed and built in Japan by Mitsui and towed 3000 miles Khanom at Nakhon Si Tammarat. The oil or gas-fuelled steam plant forms the heart of an electritication project

which includes 200 km of transmission lines and three substations.
NEIC

ENERGY CONSERVATION, CONSUMPTION AND UTILIZATION

14. Cement industry in Thailand

Siddhikol, A.
From: Energy conservation in cement industry : some experiences
p.109-128
ENERGY CONSERVATION/ CEMENT INDUSTRY/ THAILAND

Looks at the cement industry in Thailand and use of energy in cement plants.
620.9:666.94(5-012) Asi
ESCAP

15. Development of energy in Thailand in the '80s

Ruyabhorn, Pravit
Thailand. National Energy Administration
Bangkok
1980
71p. : tables
ENERGY CONSUMPTION/ ENERGY POLICY/ THAILAND

This report describes energy consumption in various sectors. It foresees energy policy and some problems.
333.79 Pra
NEIC

16. Energy conservation in cement industry : some experiences

Asian Productivity Organization
Tokyo

1982

ii, 305p.

ENERGY CONSERVATION/ CEMENT INDUSTRY/ ASIA

Selected country papers from participating countries :- China, India, Indonesia, Korea, Nepal, Pakistan, Philippines, Sri Lanka and Thailand, on the status and trends of cement industry, energy issues and capacity utilization of cement.

620.9:666.94(5-012) Asi

ESCAP

17. An energy data base for ASEAN

Chinavinijkul, Jongkid

Asian Institute of Technology

Bangkok

1982

108p.

ECONOMETRICS/ ENERGY ECONOMICS/ ASEAN

Studies macroeconomic data on energy situation in ASEAN, with relationships between energy consumption and economic activity surveyed. Thesis includes statistics of energy supply and demand for each country.

AIT S.S.P.R. no. IE-82-2

AIT

18. Identification and recommendations of energy saving opportunities in Thailand

Gas and Fuel Corporation of Victoria. Energy Management Centre

Clayton, Vic.

1982

1 v. (various pagings)

ENERGY CONSERVATION/ TRANSPORT/ INDUSTRY/ NON-CONVENTIONAL ENERGY SOURCES/ RECOMMENDATION/ THAILAND

XX

The areas for potential saving have been grouped under four main headings:- transport, industry, power generation and alternative energy forms. Its purpose is to relate the experience of others in similar circumstances and wherever possible to present documentation on their actions and findings.
620.9(593) Ene
ESCAP

19. Southeast Asia and the fuel crisis

Gosling, David L.
Hull
University of Hull
1981
59p.
ENERGY CONSUMPTION/ SOUTH EAST ASIA/ THAILAND

The report comprises account of a Southeast Asian regional energy consultation and analysis of Thailand's energy problems as a case study.
333.7913 Gos
NEIC

20. A study on the dynamics of energy utilization in Thailand

Wonkwon, Chackapong
Asian Institute of Technology
Bangkok
1978
127p. in various pagings
ENERGY MODELS/ ENERGY POLICY/ THAILAND

Presents a model for energy utilization and planning. Sectors involved are transportation, agriculture, industry, utilities and services.
AIT Thesis no. 1372

21. Der Energiebedarf Thailands : eine okonometrische modellstudie = Energy demand in Thailand and econometric model study

Grunwald, Volker

Frankfurt am Main

Peter D. Lang

1980

397p.

ECONOMETRICS/ ENERGY MODELS/ THAILAND

A model system was produced as an instrument for planning design on the energy sector, especially for energy projections covering all sectors of the economy. This is a macro-economic and energy model designed during two visits to Thailand in 1977 and 1978.

333.7912 Gru

NEIC

22. Energy planning in the ASEAN countries

US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/ Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)

From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning

p.632-641

ENERGY PLANNING/ ASEAN

Final report on energy planning. Discusses present state of planning processes and implementation. Recommends need for better data, improved modelling and net pricing for purposes of energy conservation.

333.7917 EneU

NEIC

XX

23. Energy planning in developing countries

Dunkerley, Joy

US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/ Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)

From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning

p.526-550

ENERGY PLANNING/ DEVELOPING COUNTRIES

Developing countries emphasize projections and strategies rather than implementation. Realistic assumptions and flexibility should be the basis in order to deal with uncertainties.

333.7917 EneU

NEIC

24. The energy policy and energy development plan of Thailand in the 5th National Economic and Social Development Plan (1982-1986)

Kirtikara, K.

US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/ Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)

From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning

p.1-11

ENERGY POLICY/ ENERGY PLANNING/ ENERGY MANAGEMENT/ THAILAND

Reviews energy demand and supply situations of Thailand during the last 20 years and domestic energy resources. The Energy Policy and Energy Development Plan in the 5th National Economic and Social Development Plan is discussed. Long term energy strategies are indicated.

333.7917 EneU

NEIC

25. Good tidings under the tree

Jones, Evan

From: Petromin Asia

Dec 1982

p.18-28

PETROLEUM/ ENERGY POLICY/ MALAYSIA/ THAILAND/ INDONESIA

A detailed of review the 1982 energy situation in Asia is given. The result is that the region's energy industry is flourishing due to the energy policies followed by the government.

NEIC

26. Planning and programming of R & D projects on alternative energy development

US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/ Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)

From: US-ASEAN seminar on energy technology : biomass, coal, solar wind, energy planning

p.551-564 : diag.

NON-CONVENTIONAL ENERGY SOURCE/ ENERGY PLANNING/ THAILAND

General survey of tasks involved in national energy planning - resource assessment, supply planning and pricing policy. Appendices diagram the energy system network for Thailand.

333.7917 EneU

NEIC

27. Thailand papers on energy

ESCAP. Committee of Natural Resources (8th : 1981 Oct 27 - Nov 2 : Bangkok)

1981

71p.

XX

ENERGY POLICY/ ENERGY UTILIZATION/ ENERGY RESOURCES/ ELECTRICITY/ THAILAND

The paper describes the general situation concerning energy resources and consumption in Thailand. It focuses on the government's future plan regarding supply and demand of energy. It examines the government's efforts in the development of new and renewable resources of energy. It includes also a study on electricity supply and demand of the country.

NEIC

333.79 ThaP

28. Thailand's national energy plan

Silapabanleng, Kulthorn

Asia-Pacific Energy Studies Consultative Group, Workshop (3rd : 1980 Feb 25 - 28 : Honolulu, Hawaii)

From: National energy plans in the Asia-Pacific Region

p.783-788

ENERGY POLICY/ THAILAND

The paper outlines the actual energy situation in Thailand and the country's energy management plans for the period 1978 to 1989 when the population is expected to grow from 48.0 to 55.8 million. The planning of energy production is oriented toward a gradual replacement of imported oil by domestically available sources of fuel. Thailand has considerable deposits of lignite, oil-bearing shale, natural gas, hydropower, and some radioactive ores.

620.9:061.3(5-012) Asi No.3

ESCAP

29. Working paper of Thailand energy policy and planning 1981-1991

Thailand. National Energy Administration

Bangkok

1981

14p.

ENERGY POLICY/ ENERGY PLANNING/ THAILAND/ ASEAN

Working paper is describing energy planning and consumption in various economic sectors from 1981-1991. It shows details of sources and some co-operative projects in ASEAN.

333.7917 ThaW

NEIC

ENERGY RESOURCES

30. Ao Phai : oil, gas or coal

McCulloch, Russell

From: Business in Thailand

13(10) : 48-54

Oct 1982

COAL/ ENERGY UTILIZATION/ POWER GENERATION/ THAILAND

Deals with EGAT's study on the Ao Phai power station as to the type of energy sources needed for power generation. Focuses on Australia's assistance in a feasibility study for coal utilization.

ESCAP

31. Energy for Thailand

Kornelia and Dubois, Andreas

From: D+C Development and Cooperation

no.5 : 10-12

Sep-Oct 1982

ENERGY/ SOLAR ENERGY/ BIOGAS/ BIOMASS ENERGY/ THAILAND

Discusses current energy situation, the possibilities of using solar energy, wind energy, and biogas production.

NEIC

32. An optimal allocation of energy resources for Thailand

Rusmevichientong, Pairuch
Asian Institute of Technology
Bangkok
1978
66p. in various pagings
ENERGY CONSUMPTION/ THAILAND

All energy resources are discussed for 1976- petroleum, lignites, hydroelectric power, natural gas, nuclear power and non-commercial fuels. Emphasis is on determining an optimal energy allocation using energy models.
AIT Thesis no. 1383
AIT

33. Thailand's energy resources

From: Bangkok Bank monthly review
23(8):308-324
Aug 1982
ENERGY RESOURCES/ THAILAND

Survey of Thailand's energy situation with up-to-date statistics on forecasts, consumption, non-renewable and renewable resources. The fifth Five-Year Plan 1982-1986 calls for reduction of oil imports from 75 percent to 46 percent by 1986. Article wants reliance on local resources and better planning of energy consumption.
NEIC

34. Trends in the economy of Thailand : note by the secretariat

Interim Committee for Co-ordination of Investigations of the Lower Mekong Basin
Bangkok
1979

iii, 72p.

ECONOMIC CONDITIONS/ THAILAND

A review of economy of Thailand covering the following topics : population, manpower, agriculture, mining, industry, fisheries, power, transport, foreign trade prices, national accounts and finance.

338(593) Int c 1979

ESCAP

35. US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning

Hertzmark, Donald I., edit.

Asian Institute of Technology. Renewable Energy Resources Information Center

US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)

Bangkok

1982

641p.

RENEWABLE ENERGY SOURCES/ ENERGY TECHNOLOGY/ ASEAN

Seminar is concerned with experiences and plans of ASEAN countries in new energy technology.

333.7917 EneU

NEIC

NATURAL GAS

36. Baht rides on gas balloon : Thailand

From: Petromin Asia

Jun 1982

XX

p.26-27

NATURAL GAS/ ENERGY RESOURCES/ PETROLEUM EXPLORATION/ THAILAND

Deals with the development of natural gas resources in the Gulf of Thailand.

ESCAP

37. Gas from another gulf

From: Fluor magazine

39(2):11-13

Jun 1982

NATURAL GAS/ PIPELINES/ THAILAND

Fluor Co. was responsible for the design and construction of one of the world's longest submarine pipelines that will carry natural gas from the gulf of Thailand to the mainland. It is processed before passing into a 99 mile long pipeline to Bangkok.

NEIC

38. Natural gas and related industries in the Eastern Seaboard Development Project

From: Bangkok Bank monthly review

23(11) : 469-473

Nov 1982

NATURAL GAS/ PETROCHEMICAL INDUSTRY/ FREE TRADE AREA/ LOCATION OF INDUSTRY/ THAILAND

Discusses the development of petroleum and related industries in relation to the Eastern Seaboard development project.

NEIC

39. Natural gas : dawn of a promising era

From: Bangkok Bank monthly review

Sep 1981

22(9) : 337-351

NATURAL GAS/ PETROLEUM RESOURCES/ THAILAND

NEIC

40. Natural gas : to export or not to export? That is the question

Gregory, Frank

From: Business in Thailand

13(1):58-60

Jan 1982

NATURAL GAS/ THAILAND

Author reviews the reasons why Thailand should be exporting the LNG as proposed by Texas Pacific and the PSA Group, and calls for urgent decision-making in solving the deadlock.

NEIC

41. Saving (dollars) 1,000 m a year

From: ASEAN investor

1(6) : 14-16

Sep 1982

NATURAL GAS/ PETROLEUM EXPLORATION/ THAILAND

A brief report on the development of natural gas in Thailand.

ESCAP

42. Thailand - Liquified Petroleum Gas Project : staff appraisal report

Daffern, E. ; Moussa, S. and Shum, Mesdames S.

World Bank. East Asia and Pacific Regional Office. Energy Department

Washington, D.C.

1982

97p.

ENERGY RESOURCES/ LIQUEFIED GASES/ PETROLEUM/ THAILAND

XX

The objective is the efficient use of natural gas. Propane/LPG from the gas separation plant will substitute LPG imports and ensure a reliable supply, as well as meeting future growth. LPG self sufficiency and export of propane will improve the foreign exchange balance. Five LPG bulk storage marketing installations will be constructed in provincial and rural areas. Sale of LPG for cooking will reduce the usage of charcoal and fuelwood. LPG use as an automotive fuel will reduce gasoline and diesel consumption and pollution.

A XB:33 Int 3868-TH

ESCAP

43. Thailand : prickly but possible

Muqbil, Imtiaz

From: Trying to break the oil habit

p.27-35

ENERGY RESOURCES/ NATURAL GAS/ THAILAND

A X(5-012):620.9 Uni a*620.9(5-012) Uni a

ESCAP

PETROLEUM

44. Energy : fewer worries

From: Business in Thailand

14(2) : 78-83

Feb 1983

PETROLEUM EXPLORATION/ PETROLEUM INDUSTRY/ THAILAND

Presents a brief review of the energy consumption and production for 1981/82 with particular reference to the prospect of new petroleum discoveries.

NEIC

45. Esso's chonnabot find draws interest to sparsely drilled Thailand basin

From: Oil & gas journal
80(48):90-94 : tables
29 Nov 1982
PETROLEUM EXPLORATION/ THAILAND

Tables illustrate concessions for petroleum exploration in Thailand. Article outlines wildcat activities of Esso in the Khorat Plateau.
NEIC

46. For the record

Thailand. Department of Mineral Resources
From: ASEAN investor
1(6) : 19-21
Sep 1982
PETROLEUM EXPLORATION/ PETROLEUM INDUSTRY/ NATURAL GAS/ THAILAND

A summary of petroleum exploration in Thailand covering the natural gas discoveries and reserves as well as concessions for the offshore exploration in the Gulf of Thailand. Includes inland exploration in Sukhothai, and Kamphaengphet.
ESCAP

47. Impact of the oil crisis on the economic growth of developing countries - case studies for the Philippines & Thailand

Hideshima, Keiichiro and Inoue, Yutaka
International Development Center of Japan
From: IDCJ Working paper series ; 22

XX

Tokyo
1982
26p.
ECONOMIC GROWTH/ PETROLEUM/ ENERGY CRISIS/ PHILIPPINES/ THAILAND

Attempts are made to assess the degree of adverse effects that have been developed on the macro-economies of the Philippines and Thailand by the increase in the imported oil price.
338.98(1-94) Int wp No.22
ESCAP

48. Oil deposits give rise for hope

Puangklang, Treerat
From: ASEAN investor
1(4) : 34-38
Jun 1982
PETROLEUM EXPLORATION/ THAILAND

Deals with the discovery of crude oil deposits in Larn Krabue, a sub-district of Kampbaeng Phet.
ESCAP

49. Petrochemicals at the core of the plan

From: Business review (Bangkok)
11(1) : 15-18
Feb 1983
PETROCHEMICAL INDUSTRY/ TOURISM/ INDUSTRIAL AREAS/ DEVELOPMENT PLANS/ FERTILIZER INDUSTRY/ THAILAND

Presents a summary of the master plan for the development of an industrial zone along the South Eastern coast of the country,

focusing on the establishment of the petrochemical industry which is a core of the Eastern Seaboard development programme. Includes the plan for setting up a gas plant and a fertilizer complex in these "Development Planning Areas".
ESCAP

RENEWABLE ENERGY SOURCES

50. Framework for alternative energy research and development programme in Thailand (1982 - 1986)

Kirtikara, K.
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning
p.618-631
RENEWABLE ENERGY SOURCES/
THAILAND

Status review of alternative energy and demand projection in the 5th National Economic and Social Development Plan (1982 - 1986) is outlined. Budgets and activities are described for nine areas in non-conventional sources.
333.7917 EneU
NEIC

XX

51. A substitute for diesel engine oil

From: RERIC news
5(2):5-6
Aug 1982
RENEWABLE ENERGY SOURCES/ DIESEL ENGINES/ THAILAND

The Thai Ministry of Agriculture and Cooperatives is encouraging research and use of substitute fuels to diesel oil, derived from biogas, soybean oil and other vegetable oils. Tests on diesel engines using Jatropha curcas oil have given good results on farm machinery.
NEIC

52. Thailand new and renewable energy development plan

Chantavorapap, Sompongse
Thailand. National Energy Administration
Bangkok
1982
17p.
RENEWABLE ENERGY SOURCES/ THAILAND

Discussion of the government plan and policy to utilize new and renewable energy sources in both public and private sectors.
333.7917 Som
NEIC

53. Biogas and its impact on the rural development : a socio-economic analysis of Thai rural households

Sukreeyapongse, Pisit
Mahidol University
Bangkok
1979
BIOGAS/ RURAL COMMUNITIES/ THAILAND

Ten provinces contribute data to the use of biogas as resource of rural fuel. The plants are small but did effect cost of fuel consumption. Tabulated data included.
TP761 B5 P5
AIT

54. Biogas systems in Asia : a survey

Subramanian, S. K.
From: Biogas technology in the Third World : a multidisciplinary
1978
p.97-122
BIOGAS/ ENERGY RESOURCES/ INDIA/ PHILIPPINES/ THAILAND/ INDONESIA/ KOREA R/ BANGLADESH/ NEPAL/ PAKISTAN/ SRI LANKA

ESCAP

55. Biomass energy through microbial processes

Tanticharoen, M.
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/ Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning

XX

p.101-120 : tables
ANAEROBIC DIGESTION/ BIOMASS ENERGY/ MICROBIAL PROCESSES/ THAILAND

Some microbial processes in the conversion of biomass to energy have been industrially applied in Thailand - mainly in alcohol technology and methane production. More encouragement is needed since raw material is abundant.
333.7917 EneU
NEIC

56. Biomass potential in Thailand

Slesser, M. and Sintunawa, C.
From: Energy for rural and island communities
p.281-288
BIOMASS ENERGY/ RENEWABLE RESOURCES/ THAILAND

The paper explores, by means of a dynamic similation model, the potential advantage of switching food producing land to biomass production for subsequent alcohol manufacture as an energy import substitute. It is found that the results, while favourable to energy security, may not favour balance of payments. However it depends on the future energy and rice prices and the potential of biomass systems.
333.7911 EneF
NEIC

57. Biomass uses, conversions and productions in Thailand

Chomcharn, Aroon
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/ Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning

p.207-222 : tables

BIOMASS ENERGY/ THAILAND

Energy uses from wood, bagasse and rice husks accounted for 130 x 10 sq.root 12 kilocalories in 1977. Purpose of paper is to elaborate on the potential role of research and development in bioenergy.

333.7917 EneU

NEIC

58. Utilization of biogas digesters in Thailand

Chantavorapap, Sompongse

Thailand. National Energy Administration

Bangkok

1978

33p.

BIOGAS/ BIOMASS ENERGY/ THAILAND

This paper is concentrated on result of survey made by NEA. Also includes models of digesters being promoted, research and development being done by various government agencies, universities, institutions and interested individual in the country. Domestic requirement of energy for cooking and lighting is evaluated.

333.7938 Cha

NEIC

HYDRO POWER

59. Piling strengthens Thailand dam foundation

From: World construction

35(8):14-15

Aug 1982

DAMS/ HYDROELECTRIC POWER/ THAILAND

XX

Article deals with the project of Khao Laem dam on the Quae Noi River in Thailand. Dam will provide generating station of three 100,000 kw units. Due to be completed 1984 and will also supply irrigation water. The main problem in building the dam has been in the type of rock present-calcareous limestone with karstic characteristics.
NEIC

60. Thailand's largest dam : solving the construction problems

From: World construction
35(2):22-24
Feb 1982
DAMS/ HYDROELECTRIC POWER/ THAILAND

One of the biggest Thai hydro schemes is the 300-MW Khao Laem project Located on the Quae Noi River. The Snowy Mountains Engineering Corporation of Australia are its consultants. Article discusses problems of placing of the rock fill mainly. The benefits of the dam include 64 percent power generation, 15 percent flood mitigation and 21 percent water supply. Due to be commissioned by the end of 1983.
NEIC

61. Thailand's prime dam - Mae Chang nears completion on schedule

From: Construction industry international
8(12):17-20
Dec 1982
DAMS/ THAILAND

The Mae Chang dam in Lampang province will be completed. Irrigation and power will be its main purposes.
NEIC

SOLAR ENERGY

62. Analytical performance of solar pond for GBM

Rojanasaroj, Sawitre and Chuntranuluck, Suradej
Seminar on Solar Electric Power Systems (1982 Jan 12 - 15 : Bangkok)
From: Solar electric power systems
(p.310-321) : tables
SOLAR PONDS/ RESEARCH/ THAILAND

Prediction for performance of solar pond in Greater Bangkok is carried out.

621.47 Sol

NEIC

63. Assessing the availability of solar energy in Thailand

Exell, R.H.B.
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning
p.467-483 : diag., tables
SOLAR ENERGY/ SOLAR RADIATION/ THAILAND

Solar radiation data is available over a 5-year period 1968-72 and daily duration of sunshine data from 18 stations all over the Kingdom. Paper analyzes the solar radiation data using tables and diagrams.

333.7917 EneU

NEIC

XX

64. Assessment of the validity and potential usefulness of the Non-Linear Saunier model in predicting thermal solar collectors performance

Ang, Kou Soon

Asian Institute of Technology

Bangkok

1981

62p.

RESEARCH/ SOLAR THERMAL POWER PLANTS/ THAILAND

Tests for the validity of the Non-Linear Saunier's model are based on the thermal performance of five solar collectors.

AIT Thesis no. ET-81-13

AIT

65. Atmospheric radiation and sky temperatures in Thailand

Kalwar, Mohammad Issa

Asian Institute of Technology

Bangkok

1976

61p.

SOLAR RADIATION/ THAILAND

Comprehensive survey of atmospheric radiation and sky temperatures at Chiang Mai, Ubon, Bangkok, and Songkhla in Thailand using empirical methods. The Swinbank Tormula and the Angstrom-Asklot method were adopted for the study. The results showed that there are fairly good prospects for water cooling and natural air-conditioning.

AIT S.S.P.R. no.87

AIT

66. The availability of solar energy in Thailand

Exell, R.H.B and Saricali, Kaya
Asian Institute of Technology
Bangkok
1976
85p.
SOLAR RADIATION/ THAILAND

Survey, study and analysis of solar data to provide information in a suitable form for use in designing and predicting the performance of solar energy equipment.

67. Construction of an original test bed for evaluating solar collector performance non-linearly

Poolpol, Sompan
Asian Institute of Technology
Bangkok
1981
55p.
RESEARCH/ SOLAR COLLECTORS/ THAILAND

Three kinds of commercial collectors were tested and error of results and instruments used were analysed. New method of determing back and side loss coefficient of collector was suggested and some problems in the experimental work were discussed.

AIT Thesis no. ET-81-11
AIT

68. Design and testing of a solar powered refrigerator

Exell, R.H.B. and Kornsakoo, Sommai

XX

Asian Institute of Technology
Bangkok
1981
88p.
RESEARCH/ SOLAR REFRIGERATORS/ THAILAND

Two prototype intermittent ammonia-water absorption refrigerators were designed and tested as a step to develop a village-sized refrigerator. The cost of ice produced by this system would be 2 to 3 times the city price. Technical problems and new design features are reported.
AIT Research Report no.126
AIT

69. Design and testing of an absorber for a dehumidification system regenerated by solar energy

Tan Kah Hock
Asian Institute of Technology
Bangkok
1981
64p. : diag., tables
SOLAR ENERGY/ RESEARCH/ THAILAND

Small experimental absorber using calcium chloride as liquid desiccant has been constructed and effectively operated as a first step towards development of solar dehumidification system.
AIT Thesis no. ET-81-5
AIT

70. Design, installation and techno-economic analysis of a medium temperature cylindro-parabolic solar system

Yeo, A.T.
Asian Institute of Technology

Bangkok

1981

71p.

SOLAR COLLECTORS/ RESEARCH/ THAILAND

A medium temperative solar system using a 8 sq.m. parabolic trough concentrator with concentration ratio of 42 is studied. Includes design and working characteristics of polar mounted system, experimental testing, and performance and economic analyses.

AIT Thesis no. ET-81-15

AIT

71. The design and operation of potable water solar still for village community supply

Aftab, M.P.

Asian Institute of Technology

Bangkok

1975

99p. in various pagings : diag., tables

SOLAR STILLS/ SOLAR RADIATION/ RURAL COMMUNITIES/ THAILAND

Six pilot scale solar stills were designed and constructed to study performance under tropical conditions.

AIT Thesis no. 818

AIT

72. The development of condensing and freezing unit for a solar powered refrigerator

Hossain, Md. Forhad

Asian Institute of Technology

Bangkok

1981

56p.

RESEARCH/ SOLAR REFRIGERATORS/ THAILAND

XX

An ammonia-water intermittent absorption refrigerator with flat plate solar collector and flooded type evaporator has been constructed. Flat plate collector design has been modified to enhance ammonia generation in the early morning. Flooded type evaporator is used a base containing water surrounding evaporator coil is used to make ice.

AIT Thesis no. ET-81-12

AIT

73. Development of solar autoclave in Thailand

Kiatsiriroat, T. ; Mungkornkarn, M. and Assawawiroonhakarn

Symposium on Solar Science and Technology (1980 Nov 25 - Dec 4 : Bangkok)

From: Proceedings of the Symposium on Solar Science and Technology 25 November - 4 December 1980, Bangkok, Thailand

v.2, p.485-491

SOLAR ENERGY/ RESEARCH AND DEVELOPMENT/ THAILAND

A X(5-012):523.72 Sym V.2-523.72(5-012) Sym V.2

NEIC, ESCAP

74. Is photovoltaic solar cell technology suitable for Thailand

Panyakeow, Somsak ; Aramrattana, Manoon ; Sawadsaringkarn, Montri ; Toprasertpong, Bunyong and Bernoux, Pierre

Symposium on Solar Science and Technology (1980 Nov 25 - Dec 4 : Bangkok)

From: Proceedings of the Symposium on Solar Science and Technology 25 November - 4 December 1980, Bangkok, Thailand

v.2, p.499-505

SOLAR ENERGY/ PHOTOVOLTAIC CELLS/ SOLAR CELLS/ RESEARCH AND DEVELOPMENT/ THAILAND

A X(5-012):523.72 Sym V.2*523.72(5-012) Sym V.2
NEIC, ESCAP

75. A mathematical model for solar radiation in Thailand

Exell, R.H.B.
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning
p.484-502 : diag., tables
SOLAR ENERGY/ SOLAR RADIATION/ THAILAND

A compact first order random model for simulating daily totals of solar radiation by computer is described. Empirical formulae give satisfactory approximations and could be applicable to the rest of South East Asia.
333.7917 EneU
NEIC

76. A measurement technique of a high intensity solar flux

Thongprasert, Manit
Seminar on Solar Electric Power Systems (1982 Jan 12 - 15 : Bangkok)
From: Solar electric power systems
(p.25-35) : diag., tables
SOLAR ENERGY/ SOLAR THERMAL POWER PLANTS/ SOLAR RADIATION/ RESEARCH/ THAILAND

Detailed description with tables and diagrams the high intensity solar flux measurement technique, which can be used as a standard for conversion of temperature. Study was conducted by Chulalongkorn University and the Electric Generating Authority of Thailand.
621.47 Sol
NEIC

XX

77. Model for optimizing the solar plant storage tank volume in Thailand

Chungpaibulpatana, Supachart
Asian Institute of Technology
Bangkok
1981
80p.
SOLAR THERMAL POWER PLANTS/ SOLAR RADIATION/ THAILAND

A mathematical model has been formulated to predict the performance of a solar thermal system. It is useful to undertake the cost-benefit ratio optimization prior to design and installation of system in Thailand.
AIT Thesis no. ET-81-9
AIT

78. On the use of solar energy for water pumping

Cowell, P.A. and Agarwalla, J.K.
International Conference on Rural Development Technology
An Integrated Approach (1977 Jun 21 - 24 : Bangkok)
From: Proceedings of the international conference on rural development technology : an integrated approach
p.287-300 : diag.
PUMPS/ SOLAR ENERGY/ THAILAND

Multiple rice crops in South-east Asia require use of low lift on farm farm pumps. Paper examines potential of solar-powered systems based on Thai situation.
HT107 I57 1977
AIT

79. Performance of the AIT solar rice dryer during the wet season

Boonthumjinda, Sompong

Symposium on Solar Science and Technology (1980 Nov 25 - Dec 4 : Bangkok)

From: Proceedings of the Symposium on Solar Science and Technology 25 November - 4 December 1980, Bangkok, Thailand

v.2, p.91-112

SOLAR ENERGY/ SOLAR HEATING/ RICE/ GRAIN PROCESSING/ THAILAND

Three experiments tested on the AIT solar rice dryer during the wet season in 1979 were performed, the results show that drying in the solar chamber starts at the top and the bottom layers first, the use of a chimney reduces the drying time of paddy in a 125 mm. bed by about ten percent, stirring in a 100 mm. rice bed in a chamber with chimney reduces the drying time by about one half.

A X(5-012):523.72 Sym V.2*523.72(5-012) Sym V.2

NEIC, ESCAP

80. Proceeding of the Symposium on Solar Science and Technology 25 November - 4 December 1980, Bangkok, Thailand

United Nations

Symposium on Solar Science and Technology (1980 Nov 25 - Dec 4 : Bangkok)

New York

United Nations

1981

2 v.

SOLAR ENERGY/ RESEARCH AND DEVELOPMENT/ REGIONAL CO-OPERATION/ ASIA/ PACIFIC REGION

A X(5-012):523.72 Sym V.1*523.72(5-012) Sym

NEIC, ESCAP

XX

81. Prospects and problems of the solar energy industry in Thailand

Frankel, Richard J. ; Kumpengsath, Taweesin and Thonprasert, Manit

Symposium on Solar Science and Technology (1980 Nov 25 - Dec 4 : Bangkok)

From: Proceedings of the Symposium on Solar Science and Technology 25 November - 4 December 1980, Bangkok, Thailand

v.2, p.55-69

SOLAR ENERGY/ SOLAR HEATING/ WATER HEATERS/ RESEARCH AND DEVELOPMENT/ THAILAND

A X(5-012):523.72 Sym V.2*523.72(5-012) Sym V.2

NEIC, ESCAP

82. Relationships between solar radiation and some meteorological data of Thailand

Kirtikara, K. and Siriprayuk, T.

Symposium on Solar Science and Technology (1980 Nov 25 - Dec 4 : Bangkok)

From: Proceedings of the Symposium on Solar Science and Technology 25 November - 4 December 1980, Bangkok, Thailand

v.2, p. 481 - 484

SOLAR RADIATION/ METEOROLOGY/ DATA COLLECTING/ RESEARCH AND DEVELOPMENT/ THAILAND

A X(5-012):523.72 Sym V.2*523.72(5-012) Sym V.2

NEIC, ESCAP

83. Research, development and use of solar energy in Thailand

Thailand. National Energy Administration

Expert Working Group Meeting on the use of Solar and Wind Energy (1976 Mar 2 - 9 : Bangkok)

From: Proceedings of the meeting of the expert working group on the use of solar and wind energy

p.45

SOLAR ENERGY/ RESEARCH/ THAILAND

Solar food drying is in use in primitive ways. Research is carried out on water-heating, flat-plate collector, distillation, drying, pumping, refrigeration at KMIT and AIT. Includes an investigation on measuring stations of radiation.

333.7923 EcoP

NEIC

84. Solar cell calibration and measurement

Loong Hai Ti

Asian Institute of Technology

Bangkok

1981

42p. : diag., tables

SOLAR CELLS/ RESEARCH/ THAILAND

Techniques and methodology for solar cell performance and diagnostic measurement are described. A reference solar cell has been calibrated for outdoor performance measurement purposes. Indoor and outdoor results have been compared.

AIT Thesis no. ET-61-4

AIT

85. Solar electricity and EGAT

Jivacate, Chaya

Seminar on Solar Electric Power Systems (1982 Jan 12 - 15 : Bangkok)

From: Solar electric power systems

(p.47-64)

SOLAR THERMAL POWER PLANTS/ THAILAND

XX

The strategy of approach of Electricity Generating Authority of Thailand toward solar electricity is presented along with its current status and future outlook. Accordingly some small scale demonstration, test and evaluation of commercially available hardware are conducted as "in-house activity" while support to university R & D are also realized.

621.47 Sol

NEIC

86. Solar electric power systems

King Mongkut Institute of Technology, Thonburi ; United Nations Educational, Scientific and Cultural Organization ; Federation of Engineering Institutions in South East Asia and Pacific

Seminar on Solar Electric Power systems (1982 Jan 12 - 15 : Bangkok)

Bangkok

King Mongkut Institute of Technology, Thonburi

1982

(321p.)

ELECTRIC POWER/ SOLAR ENERGY/ RESEARCH/ ASIA

Contains the papers discussing solar thermal electric power, photovoltaic, wind electric and other systems. Delegates were from Thailand, Hong Kong, Malaysia and Singapore.

621.47 Sol

NEIC

87. Solar energy development in Thailand

Ratanapratarn, Oran

Symposium on Solar Science and Technology (1980 Nov 25 - Dec 4 : Bangkok)

From: Proceedings of the Symposium on Solar Science and Technology 25 November - 4 December 1980, Bangkok, Thailand

v.1, p.274-277

SOLAR ENERGY/ RESEARCH AND DEVELOPMENT/ THAILAND

A X(5-012):523.72 Sym V.1*523.72(5-012) Sym V.1

NEIC, ESCAP

88. Solar energy in Southeast Asia

Exell, R.H.B.

Expert Working Group Meeting on the Use of Solar and Wind Energy (1976 Mar 2 - 9 : Bangkok)

From: Proceedings of the meeting of the expert working group on the use of solar and wind energy

p.41

SOLAR RADIATION/ SOUTH EAST ASIA/ THAILAND

Solar data collected in Thailand could apply to other Asian countries. AIT research on water pumps, stills, ice-makers and drying units. Author asks for ESCAP to be clearing house of information on solar energy projects.

333.7923 EcoP

NEIC

89. Solar radiation tables for architects in Thailand

Exell, R.H.B. and Kumar, Ravindra

Asian Institute of Technology. Renewable Energy Resources Information Center

Bangkok

1981

40p.

SOLAR RADIATION/ THAILAND

XX

Tables are given of solar radiation on surfaces of buildings at Chiang Mai, Bangkok and Songkhla. Radiation tables contain solar irradiances on horizontal surfaces, vertical walls facing eight directions, and vertical cylinders. Results are given for clear skies and for average weather conditions in each one and half month period.

Research report no.128

AIT

90. Solar rice dryer : do it yourself handbook

Boonthumjinda, Sompong

Asian Institute of Technology

Bangkok

1982

91p.

RESEARCH/ SOLAR DRYERS/ THAILAND

Handbook for developing a simple solar rice dryer to provide the poorer rice farmer with a method of drying a second crop during the wet season.

TJ810 S661

AIT

91. Statistical analysis of hourly solar radiation in Thailand

Huq, Md. Maminul

Asian Institute of Technology

Bangkok

1977

126p.

SOLAR RADIATION/ THAILAND

Comparisons of simulations by purely random model and Markov chain model with observed series of six radiation classes for different seasons of the year were made.

AIT thesis no. 1256

AIT

92. Status of solar energy development in Thailand

Rutanaprakarn, O.

US-ASEAN Seminar ON Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)

From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning

p.444-456

SOLAR ENERGY/ THAILAND

Several research and development projects exist in Thailand, but only solar hot water application is commercial. Increased utilization is expected by 1985 as goverment installs more demonstration projects. List of solar hot water systems is included.

333.7917 EneU

NEIC

93. The Thai domestic dryer

From: RERIC news

5(2):10-11

Aug 1982

SOLAR HEATING/ SOLAR DRYERS/ THAILAND

A description of a solar dryer constructed by the Solar Rice Dryer Project at the AIT. It is designed for drying meat, chicken, banana, chilli etc. in an efficient and hygienic way. It is cheap, portable and easily operated.

NEIC

XX

94. Thermal rock-bed storage performance

Trinestsampan, Natavut
Asian Institute of Technology
Bangkok
1981
75p. : ill., tables
THERMAL ENERGY STORAGE SYSTEMS/ THAILAND

This study deals with a solid sensible heat storage unit by using the rock-bed thermal performance. The system has a high potential for applications in solar energy systems in heating applications, such as crop drying.
AIT Thesis no. ET-81-3
AIT

95. Tracking parabolic trough

Yoksenagul, S.
Seminar on Solar Electric Power Sys·ems (1982 Jan 12 - 15 : Bangkok)
From: solar electric power systems
(p.37-45) : diag.
SOLAR THERMAL POWER PLANTS/ RESEARCH/ SOLAR RADIATION/ THAILAND

Presents design and performance test of a light-weight tracking parabolic trough which is intended to be used on a small solar electric power system.
621.47 Sol
NEIC

WIND ENERGY

96. Assessing the availability of wind energy in Thailand

Exell, R.H.B.

US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)

From: US-ASEAN seminar on energy technology : biomass, coal, solar/wind, energy planning

p.347-365

WIND ENERGY/ THAILAND

Description of wind resources and data taken at 48 stations over a 10-year period. Locally constructed windmills from wood and metal are used for irrigation purposes.

333.7917 EneU

NEIC

97. The availability of wind energy in Thailand

Exell, R.H.B. ; Thavapalachandran, S. and Mukhia, P.

Asian Institute of Technology. Renewable Energy Resources Information Center

Bangkok

1981

40p. : tables

WIND ENERGY/ THAILAND

Survey of wind regime in Thailand for use in assessing the potential for the utilization of wind energy. Hourly wind data from 44 stations in Chiang Mai, Ubon, Bangkok and Hatyai was used.

AIT Research report no. 134

AIT

XX

98. Available wind energy in Thailand for water pumping

Thavapalachandran, Sellathurai
Asian Institute of Technology
Bangkok
1980
48p.
WIND ENERGY/ PUMPS/ THAILAND

Hourly wind velocity data for one year have been used to determine the seasonal velocity distribution curves and power duration curves at stations in Chiangmai, Ubon, Bangkok and Hatyai. Energy that could be extracted from the wind by means of irrigation wind pump (soil rotor type, two-bladed rotor type and fan type) has been calculated.

AIT Thesis no. AE-80-16
AIT

99. One kWe wind electric power system : I) estimation of wind potential

Ta[illegible]nitr, K.
Seminar on Solar Electric Power Systems (1982 Jan 12 - 15 : Bangkok)
From: Solar electric power systems
(p.220-237) : diag.
WIND ENERGY/ RESEARCH/ THAILAND

Studies wind potential at Koa Fah Repeater Station, Nakorn Nayok Province, as a possible installation site of a wind electric power system.

621.47 Sol
NEIC

100. One kWe wind electric power system : II) electrical subsystems test results

Tanmitr, K.

Seminar on Solar Electric Power Systems (1982 Jan 12 - 15 : Bangkok)

From: Solar electric power systems

(p.238-253) : diag.

WIND ENERGY/ RESEARCH/ THAILAND

Test results of electrical subsystems of the 1 kWe wind electric power system are described.

621.47 Sol

NEIC

101. One kWe wind electric power system : III) simulation results of the electrical subsystems

Tanmitr, K.

Seminar on Solar Electric Power Systems (1982 Jan 12 - 15 : Bangkok)

From: Solar electric power systems

(p.254-262) : diag., tables

WIND ENERGY/ RESEARCH/ THAILAND

Paper describes simulation results from the electric subsystems of 1 kWe wind power electric unit.

621.47 Sol

NEIC

102. One kWe wind electric power systems : IV) wind turbine sizing

Tanmitr, K.

Seminar on Solar Electric Power Systems (1982 Jan 12 - 15 : Bangkok)

XX

From: Solar electric power systems
(p.264-274) : diag.
WIND ENERGY/ RESEARCH/ THAILAND

Describes a gyro-rotor three 11.1 metre fixed blades for wind electric power generation system. The wind turbine has the designed point at the wind speed of 5 m/s and would be capable of yielding 2 kW at that point.
621.47 Sol
NEIC

103. Research, development and use of wind energy in Thailand

Thailand. National Energy Administration
Expert Working Group Meeting on the Use of Solar and Wind Energy (1976 Mar 2 - 9 : Bangkok)
From: Proceedings of the meeting of the expert working group on the use of solar and wind energy
p.108-114
WIND ENERGY/ RESEARCH/ THAILAND

Describes basic types and utilization of locally produced windmills, for electric generation. Research programme of the NEA is described.
333.7923 EcoP
NEIC

104. A survey of the possible use of wind power in Thailand and the Philippines

Heronemus, William A.
United States of America. Agency for International Development Springfield, Va.
National Technical Information Service
1974

74p. : tables
WIND ENERGY/ THAILAND/ PHILIPPINES

Study of how wind power can be used in rural areas. Thailand uses it in a limited way to pump water only. Philippines did not use any. Designs in appendices.
TJ825 H47
AIT

105. Windmill research in Thailand

From: RERIC news
5(2):14-15
Aug 1982
WIND ENERGY/ THAILAND

Windmill research in Thailand is carried out by VITA at Ubon Ratchathani and by KMIT where about five types of windmills have been constructed for electric generation.
NEIC

106. Windmill technologies development in Thailand

Boonrowd, Chirasak
US-ASEAN Seminar on Energy Technology : Biomass, Coal, Solar/Wind, Energy Planning (1982 Jun 7 - 18 : LIPI, Bandung, Indonesia)
From: US-ASEAN Seminar on energy technology : biomass, coal, solar/wind, energy planning
p.503-517 : diag., tables
WIND ENERGY/ WINDMILLS/ THAILAND

Paper presents an overview of windmill applications for water pumping. Estimated wind energy potential is reviewed. Existing designs of windmills are discussed.
333.7917 EneU
NEIC

XX

SYNTHETIC FUELS

107. Prospects of developing power alcohol industry in Thailand

Bejraputra, Kriengkorn
Thailand. National Energy Administration
Bangkok
1979
24p. : tables
ALCOHOL FUELS/ THAILAND

Paper describes the development and problems of the alcohol industry.
333.7938 Kri
NEIC

108. Regional study on production of fuel ethanol from agro-products

Koide, Shigeaki ; Brooks, Ron B. and Vicharangsan, Tanoo
Economic and Social Commission for Asia and the Pacific
Bangkok
1982
iii, 100p.
AGRICULTURE/ ALCOHOL FUELS/ ENERGY/ LIQUID FUELS/ AUSTRALIA/ INDIA/ INDONESIA/ PHILIPPINES/ SRI LANKA/ THAILAND/ ASIA/ PACIFIC REGION

The study was conducted to identify the most promising energy crops for different countries in the ESCAP region, to evaluate process technology for converting agroproducts into liquid energy, to appraise economic costs and benefits and to propose suitable institutional mechanisms for inter-sectorally harmonious development in each country.
A X(5-012):661.722 Koi*661.722(5-012) Koi
ESCAP

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__________, "Detailed Work Plan for the National Energy Information Center", submitted to the National Energy Administration and the United States Agency for International Development (USAID), March 18, 1981.

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Sirivadhanakul, Tammachart, Interviews and discussions on the National Energy Information Center, 1982-1984.

United States Agency for International Development (USAID) Project No. 493-0304, "Project Grant Agreement", between the Kingdom of Thailand and the United States of America for Renewable Nonconventional Energy, August 29, 1979.

__________, "Annexes to Project Paper for Renewable Nonconventional Energy Project No. 493-0304, USAID/Thailand, May, 1979 and July 1979.