XII ENERGY

Project Title: AN IMPROVED SECOND ORDER METHOD FOR OPTIMAL LOAD FLOW IN ELECTRIC POWER SYSTEMS

Name and Address of Principal Investigator: Dr. Juan L. Bala, Jr., Energy and Information Technology Corporation, 5th Floor, Wing B, Concorde Condominuim Bldg., Benavidez & Salcedo Streets, Legaspi Village, Makati, Metro Manila.

Description of the Project: The Reduced Hessian method, which is inherently a second order method, has been applied to the optimal load flow problem. This method, in conjunction with a procedure for handling the constraints on the control variables, results in highly reliable convergence and excellent accuracy. Unlike most other methods, the algorithm in this paper is not dependent upon the proper selection of acceleration factors. The effectiveness of this method has been demonstrated by applying to sample systems.

Cooperating Agencies: The University of Akron—use of mainframe computer

Date Started: June, 1976

Date of Completion: June 1977

Project Title: ENERGY CAPABILITY OPTIMIZATION OF CASCADED HYDRO-GENERATION SOURCES.

Name and address of Principal Investigator: Dr. Juan L. Bala, Jr., Energy and Information Technology Corporation, 5th Floor, Wing B, Concorde Condominium Bldg., Benavidez & Salcedo Streets, Legaspi Village, Makati, Metro Manila

Description of the Project: The objective of the study is to develop a water-usage policy that will maximize electric energy production of cascaded hydrogeneration sources, and at the same time, satisfy other requirements of irrigation, domestic water supply, flood control and marine life preservation. It involves mathematical modelling of cascaded hydro sources, and computer simulation and analysis of various optimization techniques in obtaining the optimal water management scheme.

Project Cost and Source of Funding: ₱40,356.00, National Science Development Board

Cooperating Agencies: UP College of Engineering & National Science Development Board

Date Started: January 1, 1979

Duration or Expected Date of Completion: September 30, 1980

Present Status of Project: The project is presently in its final phase. Computer tests are about to be completed.

Other Relevant Information: Research Assistant: Edgar C. Portante

Project Title: ENERGY AUDIT OF THE LUZON ENERGY DELIVERY SYSTEM

Name and Address of Principal Investigator: Energy and Information Technology Corporation 5th Flr., Wing B, Concorde Cond. Bldg., Benavidez, Leg. Village,

Makati, Metro Manila

Description of the Project: The objectives of the energy audit of the Luzon energy delivery system are: (a) to establish the status of the present system, and (b) to quantify the efficiency of energy delivery within the system.

The study highlights the development and formulation of the methodology for an energy audit. The procedure is then applied in the calculations of efficiency using metered data (where available) and computer simulation results. Over-all system and sub-area efficiency; 230/115-kv transmission line efficiency; substation efficiency; feeder efficiency; and substation and load center transformer efficiencies are then established.

Project Cost and Source of Funding: ₱1.5 million, National Power Corporation

Cooperating Agencies: UPIRC for the use of their Standard Electric meters in calibrating NAPOCOR's meters. PNOC for the use of their Mainframe computer.

Date Started: September 1, 1979

Duration or Expected Date of Completion: Not Stated

Date of Completion (for completed projects): March 31, 1980

Present Status of Project: Project was completed on time and final report accepted by National Power Corporation.

Other Relevant Information: Project Personnel

Dr. Juan L. Bala, Jr. — Project Director & Principal Consultant
Dr. Luis M. Alarilla, Jr. — Principal Consultant
Dr. Jose A. Azarcon, Jr. — Principal Consultant
Dr. Victor H. Sandoval — Principal Consultant
Mr. Herminio A. Abcede — Senior Research Engineer
Mr. Artemio P. Magabo — Senior Research Engineer
Mr. MacArthur V. Delos Reyes — Senior Research Engineer

Project Title: PYROLYSIS OF AGRICULTURAL WASTE

Name and Address of Principal Investigator: Teodorico T. Festin
UP College of Engineering-
NEC Diliman, Quezon City

Description of the Project: The design, fabrication and operation of a semi-continuous, manually operated pyrolytic converter to process daily one ton of rice hulls into higher calorific value fuels. The objective of this project is to determine the feasibility of employing pyrolytic converter systems in the Philippines.

Project Cost and Source of Funding: ₱195,696.00 Bureau of Energy Development, Ministry of Energy and UNIDO

Cooperating Agencies: Center of NonConventional Sources of Energy, Georgia Institute of Technology and National Grains Authority.

Date Started: October 1, 1978.

Duration or Expected Date of Completion: October, 1980

Date of Completion (for completed projects): Not Stated

Present Status of Project: The pyrolytic system, which was locally fabricated, has been installed at the NGA compound in Cabanatuan City. It has been tested

and successfully operated. Sufficient test runs have been made and the results of these runs are being evaluated.

Other Relevant Information: The test runs show encouraging results. Energy recoveries from the pyrolysis products range from 80 to 85%.

Pyrolytic converter systems could be fabricated and manufactured in the Philippines that could process a variety of agricultural and forestry wastes.

Project Title: COMPARATIVE PERFORMANCE OF A CFR DIESEL ENGINE WHEN USING CRUDE COCONUT OIL AND ORDINARY DIESEL FUEL

Name and Address of Principal Investigator: Dr. Ibarra E. Cruz, 24 Viola St., U.P. Campus, Diliman, Quezon City

Description of the Project: Experimental Work With the ASTM-CFR Engine:

One of the earliest studies done in investigating the technical feasibility of using coconut oil was in 1976. The project was supported by the Philippine Coconut Authority.

A comparative test of an ASTM-CFR (Cooperative Fuel Research) compression-ignition engine with variable compression ratios capability showed the following results when crude coconut oil was used as substitute fuel for the diesel engine.

In 1975 experimental runs of the CFR engine using crude coconut oil, the over-all average indicated thermal efficiency was 33.3 percent at an average indicated horsepower of 6.83 compared with an over-all average indicated thermal efficiency of 32.4 percent and an average indicated horsepower of 6.84 at comparable engine speeds and compression ratios in another 75 experimental runs using diesel fuel. The operating conditions of the engine when using either fuel were the same except that the injection advance was made greater with crude coconut oil for optimum power.

Project Cost and Source of Funding: ₱75,000.00
Cooperating Agencies: PCA-UPIRC
Date Started: May, 1976
Duration or Expected Date of Completion: 7 months
Date of Completion: December, 1976
Present Status of Project: Completed

Project Title: TESTING AND EVALUATION OF GAS SAVING DEVICES

Name and Address of Principal Investigator: Dr. Ibarra E. Cruz, 24 Viola St., U.P. Campus, Diliman, Quezon City

Description of the Project: Various designs of automotive fuel-saving devices will be evaluated through review of past test results and patent literature. A number of designs which show potential will be identified and will be subjected to engine dynamometer tests and actual road tests. If warranted by

initial results, design of new and more effective fuel saving devices will be initiated.

Project Cost and Source of Funding: ₱320,000.00 (NSDB)
Cooperating Agencies: NSDB-UPERDFI
Date Started: November, 1979
Duration or Expected Date of Completion: 1 year (October, 1980)
Date of Completion (for completed projects): September 15, 1980
Present Status of Project: About to be completed

Project Title: UTILIZATION OF PRODUCER GAS AND OTHER INDIGENOUS MATERIALS AS ALTERNATIVE FUEL FOR A DIESEL ENGINE-DRIVEN IRRIGATION PROJECT

Name and Address of Principal Investigator: Dr. Ibarra E. Cruz, 24 Viola St., U.P. Campus, Diliman, Q.C.
Description of the Project: Fabrication and Installation of 5 sets of gas producer for diesel engine with hp rating at 10 hp to 40 hp at the FARM SYSTEMS DEVELOPMENT CORPORATION (FSDC) demonstration farm in Valenzuela, Bulacan. The operation runs continuously since November, 1979 for 8 hours a day, 5 days a week on 60 to 80 percent of the energy from charcoal producer gas.
Project Cost and Source of Findings: ₱250,000.00 FSDC
Cooperating Agencies: FSDC-UPERDFI
Date Started: September, 1979
Duration or Expected Date of Completion: 9 months
Date of Completion (for completed projects): May, 1980
Present Status of Project: Test still going on.
Other Relevant Information: Ipil-Ipil wood is now used in one of the gas reactors.

Project Title: PRODUCER GAS AS FUEL FOR DIESEL ENGINE

Name and Address of Principal Invesgator: Dr. Ibarra E. Cruz, 24 Viola St., U.P. Campus, Quezon City
Description of the Project: Experimental Work With a Single-Cylinder Engine

A Lister-Blackstone, single-cylinder 5-brake horsepower diesel engine, with a bore of 4.5 inches and a stroke of 4.25 inches was used.

Load performance tests were made on the engine using various combination of fuels. The fuel inputs were measured by continuously weighing the fuel tank that supplied liquid injection fuel and the gas producer reactor which supplied producer gas to the engine. The power output was measured by a prony brake. Normal displacement of diesel with producer gas was 80%. Maximum displacement of diesel possible was 100%

Project Cost and Source of Findings: ₱25,000.00 (PCA-UPIRC)
Cooperating Agencies: PCA-UPIRC
Date Started: July, 1977
Duration or Expected Date of Completion: 1 year

Date of Completion: June, 1978
Present Status of the Project: completed

Project Title: STUDIES ON THE PERFORMANCE OF A DIESEL ENGINE USING ALCOHOL-GASOLINE MIXTURES AS SUPPLEMENTARY FUEL

Name and Address of Principal Investigator: Dr. Ibarra E. Cruz, 24 Viola St., U.P. Campus, Diliman, Quezon City

Description of the Project: Experimental studies on the use of alcohol-gasoline mixtures were done on two vehicles aside from four stationary engine. In a dual-fuel engine using alcohol-gasoline mixture and diesel. Mixture is aspirated together with air, such that it does not pre-ignite or knock during the compression stroke. Ignition is initiated near the end of the compression stroke by the normal injection of diesel fuel. Displacement of diesel fuel with alcohol was about 50%.

Project Cost and Source of Finding: ₱150,000.00
Cooperating Agencies: U.P., College of Engineering
Date Started: June 1978
Duration or Expected Date of Completion: 3rd year
Date of Completion: June 1981
Present Status of Project: ongoing

Project Title: STUDIES ON THE PRACTICAL APPLICATION OF PRODUCER GAS FROM AGRICULTURAL RESIDUES AS ALTERNATIVE FUEL FOR DIESEL ENGINE-DRIVEN IRRIGATION PROJECT

Name and Address of Principal Investigator: Dr. Ibarra E. Cruz, 24 Viola St., U.P. Campus, Diliman, Quezon City

Description of Project: Experimental work on the performance of "Ford son" 6-cylinder, 65 bhp diesel engine was conducted at the U.P. College of Engineering in the early stage of the project. The final stage, the engine was installed in a riceland in Siniloan, Laguna to irrigate 40 hectares riceland using dual-fuel. Charcoal was used for the gas producer. Displacement of diesel fuel with producer gas was from 50% to 80%.

Project Cost and Source of Finding: ₱200,000.00.
Cooperating Agencies: UP-UPERDFI-NIA
Date Started: July, 1977
Duration or Expected Date of Completion: 2 years
Date of Completion (for completed projects): June, 1979
Present Status of Project: completed

Project Title: PRODUCER GAS FROM WOOD WASTE - ITS PRODUCTION AND UTILIZATION IN AN INTERNAL COMBUSTION ENGINE

Name and Address of Principal Investigator: Dr. Ibarra E. Cruz, 24 Viola St., U.P. Campus, Diliman, Quezon City

Description of the Project: Experimental Work With a Twin-Cylinder Engine-Generator:

A Lombardini L-20, twin-cylinder, 12-horsepower diesel engine directly coupled to a 7.5 Kw alternating current single phase generator was used. Load performance tests were made on the engine when using straight diesel, and in dual-fuel operation, producer gas from ipil wood and corn cobs. The generator was loaded by means of a water rheostat at a line voltage of 220 volts and fixed frequency of 62 cycles per second (which corresponded to an engine rpm of 1800). The load was varied from 1 Kw to over 7.5 Kw on straight diesel and from below 4 Kw to over 7.5 Kw in dual fuel operation. Average displacement of diesel fuel with producer gas was about 80%.

Project Cost and Source of Findings: ₱100,000.00 Source: NSDB-UP
Cooperating Agencies: NSDB-UP
Date Started: March, 1977
Duration or Expected Date of Completion: 1 year
Date of Completion: December, 1979
Present Status of Project: completed

Project Title: 1. NERY HYDROGEN POWERED AUTOMOBILE
2. NERY WAVE POWERED PLANT
3. NERY MINI HYDRO POWERED PLANT

Name and Address of Principal Investigator: Saturnino Imperial Nery,Jr.
Bgy. II, Albay, Dist., Legazpi City

Description of the Project: (on-going projects)

Due to financial constraints the above projects can not go on.

1. pure hydrogen gas to run gas engines
2. Generation of electrical energy by a wave-actuated float.
3. Pontoon mounted power plant for a suitable river without aid of a dam, or pontoon mounted plant operated by ocean current in San Bernardino Strait.

Project Cost and Source of Funding:

1. Researcher-inventor cannot afford a project study.
2. same as above
3. same as above

Cooperating Agencies: Prospective cooperating agency-Bicol University, Legazpi City
Date Started: 1. Dec. 1979 2. April, 1977 3. March, 1978
Duration or Expected Date of Completion: 1. one year 2. two years 3. two years
Date of Completion (for completed projects): 1. one year after start 2. two years after start 3. two years after start.
Present Status of Project: 1. half way to test run 2. awaiting financial assistance 3. awaiting financial assistance

Project Title: VERTICAL-SHAFT MOVALBE BLADES WINDMILL (VSMB)

Name and Address of Principal Investigator: Ricardo C. Asin
Bulacan College of Arts and Trades

Description of the Project: The Vertical-Shaft Movable-Blades Windmill consists of blades arranged like the shutters of a jalousy-type window. These blades are closed when being pushed by the wind and open when moving against it. This motion of the blades is accomplished through the use of a cylindrical cam which also rotates about the axis of the shaft so that the active blades are always facing the wind.

Project Cost and Source of Funding: ₱ 5,000.00 Bulacan College of Arts and Trades

Cooperating Agencies: None

Date Started: June 16, 1980

Duration or Expected Date of Completion: Feb. 15, 1981.

Present Status of Project: Ready for Fabrication, Assembly and Erection of Prototype.

Other Relevant Information: Research data shows that the VSMB windmill produces a greater torque compared to a conventional windmill. However, final conclusion is yet to be obtained from a prototype.

Project Title: DESIGN, CONSTRUCTION AND TEST OF A FLAT-PLATE SOLAR ENERGY COLLECTOR

Name and Address of Principal Investigator: Ricarte A. Melchor, et. al.

Description of the Project: Solar water heating is a practical way of providing domestic hot water supply at a reasonable cost. The first cost of a solar heater system is certainly greater than that of conventional installations, but over a period of years, this is more than recovered by the savings in the cost of operation and maintenance.

Project Cost and Source of Funding: (1980) ₱3,347.30

Cooperating Agencies: Gregorio Araneta University Foundation

Project Title: STUDIES ON THE PRACTICAL APPLICATION OF BIOGAS AS AN ALTERNATIVE OR AUGMENTATION FUEL FOR DIESEL ENGINE.

Name and Address of Principal Investigator: Prof. Jose D. Claro
MSU-IIT

Description: The study aims to find effective means of utilizing biogas as an alternative fuel for a stationary diesel engine. Gas cleaning devices will be incorporated in the modified engine set-up. Economic viability to be determined.

Project Cost: ₱57,000.00

Source of Funding: MSU-Iligan Institute of Technology

Duration of the Project: 8 months

Present Status: (As of August 5, 1980) An existing piggery project site was selected. A biogas digester was already constructed.

Project Title: STUDIES ON THE UTILIZATION OF PRODUCER GAS FROM CORNCOBS IN A CORN DRYER.

Name and Address of Principal Investigator: Mr. Deuel H. Allen
MSU-IIT

Description of the project: A producer gas fuel generated corncobs will be used to suuply energy to an appropriately designed dyer. The dryer will be used for drying corn and other agricultural products.

Project Cost: ₱39,000.00

Source of Funding: MSU-Iligan Institute of Technology

Duration: 7 months

Present Status (As of August 5, 1980): Detailed designs of gas producer and dryer already completed. Fabrication about to start.

Project Title: SOLAR DRYING TECHNOLOGY DISPERSAL FOR COUNTRY-SIDE DEVELOPMENT

Principal Investigator: Dr. Ignacio S. Pablo
Philippine Institute of Nutrition Food Science and Tech.
Philippine Women's University, Taft Ave., Manila

Description of the Project: A pre-feasibility study was done during the first year of the project. This involves: a survey of raw material availability in the pilot areas, identification of recipients, distribution of dryersto 5 initial recipients who assessed the use of the Mobile Solar Dryers for small scale commercial ventures.

Project Cost and Source of Funding: Initial budget of ₱ 236.000.00 for the first year of work. Funding from the Bureau of Energy Development, Ministry of Energy. Additional funding of ₱ 231,000.00 is expected for the second year.

Cooperating Agencies: BED; Philippine Women's University; Project Sta Barbara, Office of the President, UP Institute of Small Scale Industries.

Date Started: January 1979

Duration: Initial funding was only for the first year but the project will be extended up to Sept. 1981.

Present Status of the Project: The pre-feasibility phase of the study was completed. Further data gathering from additional recipients will be needed to be able to assess the feasibility of using these dryers for small scale commercial food processing.

Project Title: COMPARATIVE STUDY OF THE FOLLOWING MOLDED FUELS ON THEIR HEAT EMISSION

1. Pure rice hulls
2. Pure sawdust
3. Mixture of rice hulls and saw dust
4. Mixture of rice hulls, saw dust and carabao manure

Name and Address of Principal Investigator: Ariel Barrera and Oscar V. Nero

Description of the Project: The different samples were binded by starch solution and molded with a locally made molder. The molded samples were dried under the sun. To test for their heat emission, the samples were ignited all at the same time in a locally made burner by cooking the same amount of rice.

Project Cost and Sources of Funding: The project is estimated to cost 10 centavos for each sample and was funded by RMMSAT Science Club and School.

Cooperating Agencies: M E C and S F P
Date Started: July 15, 1979
Date Completed: August 19, 1979
Present Status of Project: Functional

Project Title: SOLAR DRYING OF SOME PHILIPPINE WOOD SPECIES

Name and Address of Principal Investigator: Ricardo F. Casin
FORPRIDECOM, College, Laguna

Description of the Project: Studies on solar lumber drying in the Philippines started in 1965 when FORPRIDECOM designed and constructed a portable-demountable solar lumber dry kiln. The performance of the dryer was evaluated in Quezon City in 1965; Lingayen, Pangasinan in 1966; and College, Laguna in 1968.

The dryer has a capacity of about 500 bd. ft. of lumber and the structure measures 7 ft. wide by 5.5 ft. long by 7.5 ft. high. The roof and the east and west walls were sheathed inside with corrugated aluminum sheets painted dull black. A 0.004" plastic sheet was placed as the outer lining but maintaining a 6" air space between the corrugated sheets. The north and south walls are of plywood panels.

Air circulation was provided by a 30-inch dia. propeller fan, V-belt driven by a 3/4 hp motor. Vents are provided and manually controlled.

Project Cost and Source of Funding: ₱16,000 — FORPRIDECOM

Cooperating Agencies: Inter-Island Const. Co., (2) Pangasinan School of Arts and Trades, and (3) College of Forestry, UPLB

Present Status of Project: The project was terminated in 1969. Among the problems encountered are: 1) excessive flexing and embrittlement of plastic film; 2) severe checking and case-hardening of lumber resulted due to the absence of suitable humidification system; and 3) in areas with prolonged wet season, the dryer could be of a disadvantage.

Results published, entitled, "Solar lumber drying of Apitong, Narra, Red Lauan, and Tangle". The Philippine Lumberman, April issue of 1969, Vol. XV, No. 4.

Other Relevant Information: Because of the problems encountered a new design was conceived changing the plastic to a thicker material, some means of humidification provided, auxiliary heating system incorporated, and means of storing excess heat for nighttime drying.

Project Title: DESIGN, CONSTRUCTION AND EVALUATION OF SOLAR LUMBER DRYER WITH AUXILIARY HEATING SYSTEM

Name and Address of Principal Investigator: Ricardo F. Casin
FORPRIDECOM, College, Laguna

Description of the Project: An external solar heat collector-storage was designed to supply the required heat of a lumber dryer with a capacity of 2,000 bd. ft. The collector material is of 0.04" thick reinforced polyster material, double layer, known commercially as "KALWALL". The external collector is about 2.5 ft high by 12 ft. wide by 36 ft. long with river stones as the heat absorbing material.

The heated air is blown to an adjacent lumber dryer by means of ducting and blower. Part of the moist air will be returned to the collector for reheating. Blower is automatically controlled depending upon the temperature requirements of the lumber dryer.

The dryer is of the forced-air circulation with 3 fans, directly connected to a motor. Humidifier and humidistat provides the required humidity and control vent openings. Auxiliary heating is provided to be used only during prolonged rainy days or days with low-light intensity.

Project Cost and Source of Funding: ₱220,652 - USAID; ₱35,140 - Bureau of Energy Dev.; ₱103,477 - FORPRIDECOM

Cooperating Agencies: Furniture manufacturers in Metro Manila

Date Started: September 1, 1979

Duration or Expected Date of Completion: After 30 months

Present Status of Project: The design phase of the heat collector-storage, ducting system, lumber dryer, auxiliary heater, and controlling system was completed. Construction of the structure of the portable-demountable dryer is being made. A search for a cooperator in Metro Manila was started.

Other Relevant Information: The unit will be constructed in the site of a cooperator and to be tested of its performance. Exposure periods is for one year; Dec-Feb.; March-May; and July-Sept. Drying data will be collected and analyzed.

Project Title: INTEGRATED TESTING OF ENERGY CONSUMING SYSTEMS AND DEVICES

Name and Address of Principal Investigator: Bureau of Energy Utilization
Merritt Road, Fort Bonifacio, Makati

Project Description: The project will consist of two major activities: the testing of various alternative fuels on a pilot-scale boiler and on industrial heating equipment, and testing of various household energy-consuming appliances. The pilot-scale tests of the first activity will be conducted on a boiler to be purchased and installed at the CNED premises in Quezon City. The on-the-run tests will be conducted on industrial heating systems of participating private companies. Alternative fuels being considered for testing are powdered coal, coal-oil, hydro-oil and oil-humidified air mixtures.

The second activity will test the energy efficiencies of household appliances in a calorimeter room and laboratory to be constructed on the CNED premises in Quezon City.

Project Cost: ₱1,250,000

Source of Funding: Center for Nonconventional Energy Development, Bureau of Energy Utilization.

Cooperating Agency: Philippine National Oil Company

Date Started: August 22, 1980

Duration: 18 months

Expected Date of Completion: March, 1982

Present Status: (As of August 31, 1980) The project proposal and budget have been approved and the Memorandum of Agreement between the Center for Nonconventional Energy Development (CNED) and the Bureau of Energy

Utilization (BEU) has been signed. The first installment of the funding has been released to BEU and equipment requisition will commence.

Others: This project was proposed in lieu of the previously approved CNED-assisted project on the "Comprehensive Road Tests of 300 Vehicles Equipped With Alco-tipid Devices."

Project Title: ENERGY SURVEY OF SOME SUGAR CENTRALS TO EVALUATE BAGASSE UTILIZATION

Name and Address of Principal Investigator: Bureau of Energy Utilization
Merritt Road, Fort Bonifacio, Makati

Project Description: Fifteen (15) sugar centrals shall be surveyed by an energy audit team for the Conservation Division of the Bureau of Energy Utilization. The objective of the project is to determine energy utilization efficiency of selected sugar centrals specifically on their bagasse utilization with the end in view of eventually providing technical assistance/advice to these sugar centrals. Consultancy services of a technical expert on this subject matter shall be availed of. Moreover, the project shall be conducted in coordination and/or consultation with the Phil. Sugar Commission.

Project Cost: ₱34,000

Source of Funding: Bureau of Energy Utilization

Cooperating Agency: Philippine Sugar Commission

Dated Started: December 1, 1980

Duration: 3 months

Expected Date of Completion: February 28, 1981

Present Status: (as of August 31, 1980) The project proposal has been approved and sent to the Ministry of Budget for budget approval.

Project Title: PASSIVE COOLING OF MEDIUM SIZE BUILDING FOR HOT HUMID LOCALITIES

Name and Address of Principal Investigator: Geronimo V. Manahan
Urban Designers Associate, Inc.
10 First Street, New Manila, Q.C.

Description of the Project: The objective of this project is two-pronged; first, to design and build a model house for a middle-income family which incorporates several elements, devices, appurtenances and components that can passively-cool the building, and secondly, to develop a manual for passive cooling of medium-sized structures particularly for residences, schools, office flats and small stores.

The study shall cover design parameters for site layout, orientation, microclimatic relationships and landscaping of medium-sized buildings. The nature of materials, their articulation and combination shall be experimented on to establish insulation and heat absorbing properties as well as other energy demand factors which can positively or negatively contribute to passive-cooling of structures.

Based on the information gathered, a design of a residence incorporating methods for passively-cooling the house shall be undertaken, contract drawings prepared and the structure erected. Monitoring of indoor climate shall be undertaken to determine the relevance of the building and its components in relation to the objectives set. Graphics and textual information which can be utilized in replicating the passive-cooling approaches shall be documented and published as a manual.

Project Cost and Source of Funding: ₱400,000.00, Ministry of Energy, Bureau of Energy Development

Cooperating Agencies: University of the Philippines, College of Architecture Diliman, Quezon City

Date Started: February 1980

Duration or Expected Date of Completion: January 1981

Present Status of Project: Work Accomplished: Design and Working Drawings of the Experimental House; A Model: scale 1:50 m; Researches and Relevant Information for the Manual.

Project Title: SOLAR DRYER WITH AUXILIARY HEATING SYSTEM

Principal Investigator/Proponent: Commodore Alfredo C. Protacio
Project Sta. Barbara, Cavite

Description of the Project: This project aims to determine the efficiency of a solar dryer with auxiliary heating system utilizing tested, operational PSB design dryer and incorporating a solar collector for heating augmentation. The solar collector will be provided with biogas/burner or charcoal/wood-fired furnace to provide an alternative heating source for continuity of operation during nighttime and inclement weather. Four units of the prototype will be fabricated, tested in four sites with different materials namely cereals, marine products, tropical fruits and other agricultural crops to apply this technology for the improvement in quality of product, generate savings and replace the methods using conventional energy source.

Project Sta. Barbara has the facility and expertise to design, fabricate, test and demonstrate this type of solar dryer and further this type of technology to potential users making better use of non-conventional energy source.

Project Cost: ₱254,200

Source of Funding: BED ₱83,800; PSB ₱170,400

Date Started: January, 1979

Duration of Project: One year

Present Status of Project: The design of dryer utilizing agri-waste as fuel is being tested.

Project Title: UTILIZATION OF HOT SPRING WATERS FOR POWER GENERATION

Principal Investigator/Proponent: Bureau of Energy Development
PNPC Merritt Rd., Ft. Bonifacio, Makati

Description of the Project: Electric power generation has been confined to high enthalpy geothermal areas with the temperatures in excess of 200°C. However, researches and studies on pilot basis have been undertaken abroad to use low-enthalpy waters. Such geothermal fluids are common and extensively distributed throughout the Philippines. The technology envisioned makes use of the thermal energy of hot water to vaporize another fluid with low boiling point such as the Freon, through heat exchangers. The high pressure vapor will then be fed to a power fluid expander coupled to a generator, thus producing electrical power. With this method, it is aimed that fluids from hot springs which are usually found in rural areas as well as hot water from the conventional geothermal wells which are to be disposed can be used to generate electricity.

Project Cost: ₱670,000

Source of Funding: BED

Cooperating Agency: Commercial firms that will supply the unit

Date Started: January, 1979

Duration of Project: two years

Date of Completion: December, 1981

Present Status of Project: Fabrication of heat exhangers and component of the test set-up presently being done preparation of project site for installation of experimental set-up underway.

Other Relevant Information: Project Site: Palimpinon, Dumaguete, and Los Baños, Laguna

Project Title: PYROLYSIS OF WASTES

Principal Investigator/Proponent: Prof. Teodorico C. Festin
National Engineering Center
UP, Diliman, Quezon City

Description of the Project: This project will convert biomass material such as agricultural and wood wastes into pyrolytic oil, gas and charcoal by means of a pyrolytic converter. The pyrolytic converter will be designed to meet the desired feed capacity of one-ton per day of biomass material. The study of the nature, extent, location and selection of the most likely waste material shall be made in order to optimize the production of fuels from the pyrolysis process.

Testing and evaluation of the pyrolytic converter's performance shall be made in order to improve the design and flow process of the unit. As soon as the efficiency of the converter has been standardized, operating manuals will be prepared, published and the demonstration of operating the pyrolytic converter to interested parties and manufacturers shall be done.

Project Cost: ₱1,150,500

Source of Funding: BED — ₱ 384,500
UP — ₱ 166,000
UNIDO— ₱ 600,000

Cooperating Agency: United Nations Industrial Development Organization (UNIDO)

Date Started: January, 1979
Duration of Project: one year
Present Status of Project: Test runs and analyses of the samples were undertaken. Value and utility of the pyrolytic products presently being determined.

Project Title: NATURAL HOT WATER HEATED DRYING PILOT PLANT

Principal Investigator/Proponent: Dr. Emerico R. Mendoza
Dept. of Agricul tural Process Eng'g and Tech.
Institute of Agricultural Eng'g. & Tech.
UPLB, College Laguna

Description of the Project: This program aims to demonstrate the technical feasibility of using natural hot water as the main energy source for drying of some agricultural and fishery products on a pilot scale. It is further designed to establish factors which may affect the long term operation and maintenance of the system.

A big potential exists for the utilization of natural hot water sources for the primary processing of major agricultural crops. Areas near dormant or active volcanoes like Mt. Maquiling and Mayon Volcano are good sites for the development of natural hot water fed crop drying plants, prior to the establishment of commercial scale plants. However, it is necessary to fully understand technical constraints which can affect the operation of such plants. Through a pilot level study, this project can contribute in nationalizing further exploitation of our natural hot water resources as alternative energy source in support of agricultural production.

Project Cost: ₱235,320
Source of Funding: EDB — ₱185,320
UPLB— ₱ 50,000

Date Started: January, 1978
Duration of Project: one year
Date of Completion: December, 1978
Present Status of Project: Completed

Project Title: PILOT ELECTRIFICATION OF A BARRIO USING AGRICULTURAL WASTES AS FUEL

Principal Investigator/Proponent: Mrs. Purita Festin
Economic Dev. Foundation, Inc.

Description of the Project: The project involves the design, installation and operation of a 30-Kw electric plant utilizing agricultural wastes such as wood and wood wastes, rice straw, bagasse, coir dust and coconut husk as fuel in a Laguna barrio within the jurisdiction of an electric cooperative organized by the NEA. In the process, agricultural waste is converted to produce gas which runs an internal combustion engine which, in turn, powers an electric generator. The plant can serve the electric needs of around 100 families in typical Philippine barrio. The overall feasibility of applying this electrifica-

tion concept to barrios could be evaluated based on the experience in this pilot project.

Project Cost: ₱321,100 — for the First year
Source of Funding: NSDB — ₱98,800
EDB — 94,000
NEA — 84,600
EDF — 43,700
Cooperating Agency: NSDB, EDB, NEA
Date Started: January 1, 1978
Duration of Project: 2 years
Date of Completion: January 1, 1980
Present Status of Project: completed
Other Relevant Information:
Project Cost: ₱106,400 — for 2nd year
NSDB — ₱93,500
EDB — —
NEA — —
EDF — 12,900

Project Title: SOLAR DEVICES TEST AND STANDARDS LABORATORY

Principal Investigator/Proponent: NCRD, Energy Development Board
Description of the Project: The Solar device test and standard laboratory will be an integral part of the solar demonstration house at the EDB site. It shall function mainly as a simulation facility for evaluating comparative efficiencies and characteristics of solar collectors and other nonconventional energy devices both for experimental and commercial applications. It shall have the equipment to monitor the performance of the solar air-conditioning system, gather insolation/wind data at the site and render hardware-oriented assistance to project implementors of the NCRD programs.

Project Cost: ₱748,290
Source of Funding: BED
Date Stated: October 1, 1977
Duration of Project: one year
Date of Completion: October 1, 1978
Present Status of Project: Completed

Project Title: ALTERNATIVE ENERGY SYSTEMS FOR RICE-PRODUCING COMMUNITY

Principal Investigator/Proponent: Mario L. Relampagos
Human Settlements Technology Program
Human Settlements Commission
Urban II Building, Makati, Metro Manila
Description of the Project: This project seeks to establish a human settlements model for developing a rice-producing community through the systematic adoption of a development package which consists of innovative manage-

ment techniques and adoption strategies for the selected set of productive technologies.

The development package includes: 1) medium scale biogas plant and a total system of utilizing the methane gas and by-products at both domestic and community levels, 2) commercial production of rice hull blocks out of the increasing volume of otherwise wasted rice hull in the area, 3) ferro-cement grain storage bins for the expected increasing buffer palay stocks, 4) Palay dryer utilizing solar energy alternately with biogas.

Project Cost: ₱268,771.24

Source of Funding: EDB — ₱96,211.06
HSC — 172,560.18

Date Started: January 1978

Duration of Project: Twelve months

Present Status of Project: Construction of biogas unit 90% complete; organization of BLCA now being undertaken. Construction of pigpen building which will house solar palay dryer started early May.

Other Relevant Information: Project Site: Barangay Tabe, Guiguinto, Bulacan

Project Title: LOW-COST CONTINUOUS FLOW DRYING SYSTEMS USING RICE HULL AS FUEL (PHASE II)

Principal Investigator/Proponent: Dr. Ernesto P. Lozada
AGPET, INSAET
UP at Los Banos

Description of the Project: A continuous flow rice drying system using rice hull as fuel with a capacity of 1 ton per hour was developed at UPLB and installed in Dingle, Iloilo.

The project was pursued to develop operational procedures adapted to to the socio-economic conditions of farmer's cooperatives, train farmer cooperative and personnel to run the facilities, make further improvements and to evaluate the socio-economic viability of the system being introduced.

Project Cost: ₱191,800

Source of Funding: BED ₱145,800
UPLB ₱46,000

Cooperating Agency: National Grains Authority

Date Started: April 1979

Duration of Project: One year

Project Title: COMMUNAL SYSTEM FOR CONVERTING WASTE TO ENERGY

Principal Investigator/Proponent: Mario L. Relampagos
Human Settlements Commission

Description of the Project: The project is an effort to implement on a pilot basis, the diffusion of the integrated technological package with biogas a major component.

The package includes: 1) contruction of biogas plants, algae ponds & water tanks; 2) installation of electric generator to provide electricity and drive a water pump; 3) organization of the community to operate and manage the plants, ponds and related activities & to insure equitable distribution of benefit accruable thereof; 4) skills training and information dissemination.

Three provinces Cebu, Bohol, Leyte have been selected as target areas for their high hog population frequency as of 1976 and strategic geographical locations. Feasibility study will also be conducted prior to full-scale implementation.

Project Cost: ₱368,867.04

Source of Funding: EDB — ₱101,197.60
HSC — ₱267,669.44

Cooperating Agency: None

Date Started: January 1978

Duration of Project; Twelve months

Present Status of Project: Construction of biogas plant in San Jose, Batangas nearing completion; gas holders & distribution piper now being installed. Organization of BLCA ongoing.

Other Relevant Information: Site: Sitio Alagao, Bgy. Galamay — Ano, San Jose, Batangas

Project Title: TECHNICAL AND ECONOMIC FEASIBILITY STUDY OF PRODUCING, MARKETING, AND UTILIZING ETHYL ALCOHOL AS GASOLINE FUEL COMPONENT PREPARATORY TO A REGIONAL & NATIONWIDE ALCOHOL PROGRAMS

Principal Investigator /Proponent: Philippine National Oil Company
PNPC, Merritt Rd., Fort Bonifacio
Makati, Metro Manila

Description of the Project: The proposed Alcogas Project if implemented on a regional and nationwide scale will be technically and economically advantageous to the country in terms of: 1) development of alcohol as an indigenous and renewable energy resource; 2) partial displacement of gasoline by alcohol; 3) reduced dependence on imported oil; 4) economic boost to the sugar industry 5) technical and economic benefits to the country.

The proposed study is divided into 3 parts:

Part I — Technical feasibility of utilizing a 15/85 blend of 190 proof ethyl alcohol and gasoline as motor fuel

Part II — Technical feasibility of utilizing a 15/85 blend of anhydrous ethyl alcohol and gasoline as motor fuel

Part III — Economic and Technical feasibility of a regional and nationwide alcohol program.

Project Cost: ₱495,520

Source of Funding: EDB

Cooperating Agency: Philippine Sugar Institute

Date Started: November, 1976

Duration of Project: 21 months

Present Status of Project: Supplementary studies on the feasibility of transforming engines to utilize 100% alcohol being conducted.
Other Relevant Information: Project Site: Makati, Metro Manila

Project Title: SOLAR AIR-CONDITIONED HOUSE: TECHNO-ECONOMIC ASSESSMENT UNDER PHILIPPINE CONDITIONS

Principal Investigator / Proponent: NCRD, Energy Development Board
PNPC, Merritt Rd., Ft. Bonifacio,
Makati, Metro Manila

Descriptipn of the Project: It is intended in the first program year to design and build a solar air-conditioned house to meet technical cooling requirements and to resolve problems related to construction economics and system amortization. The pilot-house is to be cooled by an absorption-type air-conditioner powered by hot water from a solar collector loop. The energy inputs is to be provided by an array of flatplate collectors and a kerosene fired backup boiler. The objective of the project is to be able to make an engineering and economic feasibility study of such a system for local use.

Project Cost: ₱674,900
Source of Funding: BED
Cooperating Agency: none
Date Started: October 1, 1977
Completion of Project: One year
Present Status of Project: Awaiting arrival of some imported equipment

Project Title: SOLAR WATER HEATING FOR ZAMBAYAN HOTEL

Principal Investigator /Proponent: Mr. Delfin Wenceslao, Jr.
Zamboanga Factors

Description of the Project: Zamboanga Factors is presently operating a 72-room hotel project in Zamboanga City using a conventional LPG-fired boiler to meet the hot water requirements of the hotel. The intention is to set-up the solar water requirements of the hotel, at the roof deck of one of the wings.

Due to high cost of LPG in the city, the hotel presently limits hot water supply during the Peak usage. But since Zamboanga's weather is generally fair & sunny all year round, it is believed that a solar hot water system can be designed to supply hot water the whole day with a minimum back up from conventional boiler.

Project Cost: ₱262,800
Source of Funding: BED ₱217,000
Zamboanga Factors — ₱45,800
Cooperating Agency: none
Date Started: February 1978
Duration of Project: Twenty - four months
Present Status of Project: new storage tank to be installed.

Project Title: DESIGN AND DEVELOPMENT OF A HOT SPRING POWER PLANT

Name and Addrress of Principal Investigator: Domingo I. Martinez
c/o De La Salle University
Taft Avenue, Manila

Description of the Project: A small power plant to harness the low heat level available from hot springs and similar low energy level sources like chimneys and process plants, is to be built. The closed cycle thermal system is to use Freon as the working medium. This project is the first of two processes.

Project Cost: ₱305,100.00

Cooperating Agencies: De La Salle University

Date Started: February 14, 1978

Duration and expected date of completion: 1st phase ended September 30 1979

Expected Duration: Two (2) years to include phase II

Present Status of Project: Phase I finished.

Other Relevant Information: The Turbine generator is under development. A Prototype turbine of fractional horsepower capacity was built and operated with compressed air and steam to over 8000 rpm speed. The power turbine scaled up from the prototype with about 10 kilowatts capacity developed problems in speed regulation. This phase of the problem is to be corrected in the second phase.

Project Title: ENERGY DEMANDS SURVEY

Principal Investigator /Proponent: G. S. Makasiar
Ministry of Energy
PNPC Merritt Rd., Ft., Bonifacio,
Makati

Description of the Project: The project involves the gathering of information on the availability and use of the various energy resources through field surveys which would serve as the basis for establishing how much of what form of energy is used by what sector or industry for what purposes. The survey will cover the usage by domestic and productive sectors of petroleum, electricity, coal and the non-conventional energy forms. Geographically, it will identify national, regional and provincial consumption. Sectorally, coverage will include household and the following establishments:

a. Agriculture, forestry & logging
b. Fisheries
c. Construction
d. Manufacturing, mining, electricity, gas & water

Project Cost: ₱499,885

Source of Funding: BED

Cooperating Agency: NCSO/NEDA

Date Started: February 1, 1978

Duration of Project: 15 months

Present Status of Project: Tabulation and analysis of survey results already completed. Reconciliations of commercial energy utilization data generated in the survey with official sales figures is on-going. Metro Manila as other urban data will be revalidated. Other urban data will be revalidated further with data gathered from another survey conducted early 1980.

Project Title: MINI-HYDRO FOR RURAL ELECTRIFICATION AND IRRIGATION

Principal Investigator /Proponent: Amado A. Lacson
Phil. Irrigation and Rural Electrification Corporation

Description of the Project: The project involves the electrification of the town in Bansud, Oriental Mindoro (population 500 families) through the use of river current (min-hydro). One of the important offshoot of the project is the irrigation of the adjoining rice fields with all year round water. These fields were formerly dependent on rain water for irrigation.

Bansud is located in the eastern part of Mindoro Island with Bansud river supplying the water needs of the area.

The project is envisioned to provide an example of the possibility to harness an indigenous source of power (river current) utilizing local talent, material and Filipino ingenuity. In particular the project can generate an increased economic activity for the community as well as provide much needed source of power namely electricity.

Project Cost: ₱314,477

Source of Funding: BED ₱118,077
Phil. Irrigation & Rural Elect. — ₱196,400

Cooperating Agency: none

Date Started: April 1979

Duration of Project: Four months

Present Status of Project: Construction of power-house is complete.
Construction of dam is half-finished

Project Title: INTEGRATED ENERGY SYSTEM FOR SMALL ISLAND SETTLEMENT

Principal Investigator /Proponent: Pablo G. Ranices
HS Technology Program
Human Settlements Commission
Urban II Building
Buendia Avenue Extension
Makati, Metro Manila

Description of the Project: This project is intended to develop a model community in a small island that is traditionally experiencing acute shortage of drinking water supply, particularly in Verde Island of Batangas City, to achieve through the adoption of a selected set of technologies which consists of the following:

a) A solar still that distills sea water and also serves as rain catchment basin during rainy days.

The distilled water as well as the rainwater will be collected in separate tanks and will be used for drinking & other purposes. The brine will be transferred to the salt making bed for salt production.

b) A windmill that pumps sea water to the solar stills and for other purposes (battery charging, fish meal grinder)

The entire project includes the preparation of the designs of the selected technologies, baseline and feasibility studies, community organization, information campaign, skills training, and coordination with local leaders.

Project Cost: ₱353,962
Source of Funding: EDB ₱227,470
Proponent's Counterpart — ₱126,492
Date Started: January 1978
Duration of Project: Twelve months
Date of Completion: January 1979
Present Status of Project: Completed

Project Title: COW MANURE BIOGAS PRODUCTION AND UTILIZATION IN AN INTEGRATED FARM SYSTEM AT THE ALABANG DAIRY PRODUCT

Principal Investigator /Proponent: Carolina J. Alviar
a) Bureau of Animal Industry
b) Alabang Dairy Project

Description of the Project: This project will devise a set-up wherein animal waste recycling results in many things of value, such as biogas, chlorella, fish, vegetables and other crops. The raw materials in making gas or bio-gas is animal manure. The biogas, which can be used as cooking fuel, is a product of anaerobic fermentation of animal waste materials. Since the fermented manure in biogas production is an ideal fertilizer for chlorella, the idea of joining chlorella production with methane gas production is a wise step.

Instead of applying the manure directly to the field crops, it is first fermented to produce methane gas. A small portion of the fermented manure and gas filtrate are used to cultivate algae for feeding animals. The chlorella pond could also be used for fertilizing other field crops. Therefore, a cycle for the additional uses of manure is established.

Project Cost: ₱347.781.18
Source of Funding: EDB ₱120,564.82
Proponent's Counterpart ₱227,218.36
Cooperating Agency: National Institute of Science and Technology
Date Started: January 1978
Duration of Project: One year
Date of Completion: December 1978
Present Status of Project: Completed

Project Title: ALCOHOL PROJECT
I. ALCOHOL PRODUCTION
II. ALCOHOL POWERED CAR

Name and Address of Principal Investigator: Artemio C. Gopez -- Alcohol Production
Romeo B. Rara — Alcohol Powered car
Philippine Atomic Energy Commission, Diliman, Quezon City

Description of the Project: This project aims to produce ethyl alcohol from molasses to be used as car fuel, to search for cheap raw-materials such as glucose from bagasse and after cellulosic substrates for the production of alcohol and to utilize saw dust and other lumber waste for fuel.

Source of Funding: PAEC, Project cost not available

Cooperating Agencies: none

Date Started: FY 1976

Expected Date of Completion: CY 1985

Present Status of Project: Being continued with support of funds from the Ministry of Energy starting CY 1980.

Other Relevant Information:

I. ALCOHOL PRODUCTION

The pilot rectifying plant's parameters were determined. Mixtures of molasses, sulfuric acid and ammomium sulfate/ area was sterilized and fermented with yeast. Almost 600 liters of ethyl alcohol with an average volume percentage of 91% to 92% was obtained during the plant's operation. Studies were initiated on other materials like bagasse and wood shavings.

II. ALCOHOL POWERED CAR

On its test runs in Metro Manila, 59.07 kms. was logged with an average fuel consumption rate of 2.8 km/liter. Low rates obtained was attributed to low grade fuel (91% alcohol), adverse traffic conditions and the uncertainties found in fuel reading and the defective spring tension of the choke valve.

Improved engine performance results were obtained during the test run to Sta. Rosa, Laguna. The average fuel rate was 3.44 kms/liter with a total distance of 96 kms.

Project Title: DRYING TECHNOLOGY USING SOLAR & OTHER NON-CONVENTIONAL ENERGY RESOURCES FOR COUNTRYSIDE DISPERSAL AND DEVELOPMENT

Name and Address of Principal Investigator: Dr. Ignacio S. Pablo

Description of the Project: Using solar energy in Food Processing

Project Cost and Source of Funding: BED (₱230,000)
Cooperating Agencies: PINFST, UPISSI, BED (ME), Project Sta. Barbara, Office of the President
Date Started: January 15, 1978
Date of Completion (for completed projects): June 1980
Present Status of Project: Completed but on report writing

Project Title: UTILIZATION OF SOLAR ENERGY FOR DOMESTIC AND INDUSTRIAL APPLICATIONS

Name and Address of Principal Investigator: Dr. Leopoldo V. Abis; UP College of Engineering, Diliman, Q.C.
Description of the Project: Basic research has demonstrated that solar energy will convert salt water into fresh water using solar stills. Outdoor laboratory testing of a flat-plate solar collector was undertaken. Also, a laboratory-size compound parabolic concentrator was designed and tested for performance. Results were evaluated for both devices.
Project Cost and Source of Funding: ₱ 63,000.00 (last annual budget only); National Science Development Board
Cooperating Agencies: National Science Development Board, UP College of Engineering and Office of Research Coordination
Date of Completion (for completed projects): Feb. 1979
Present Status of Project: The study on solar desalination has been the basis of design for a medium-scale solar still pilot plant. A 100 liter per day capacity solar still plant was constructed utilizing the principles of the basic design but with some modifications.

Project Title: SOLAR-DISTILLED WATER FOR LIVESTOCK VACCINE PRODUCTION

Name and Address of Principal Investigator: Dr. Leopoldo V. Abis, UP College of Engineering, Diliman, Quezon City, Metro Manila; Dr. Nestor Escandor, Bureau of Animal Industry, Quezon City.
Description of the Project: The Project aims at the design, construction and testing of a pilot or prototype solar still with the end objective of producing the needed distilled water for the manufacture of vaccines.
Project Cost and Source of Funding: BED Financing — ₱152,700, Proponent's Counterpart-₱227,150
Cooperating Agencies: Bureau of Energy Development; University of the Philippines Engineering Research & Development Foundation, Inc.
Date Started: August, 1978
Date of Completion (for completed projects): June, 1979
Present Status of Project: A 100-liter per day capacity solar distillation plant has been installed at the premises of the Laboratory Services Divi-

sion of BAI at Diliman, Quezon City. Distillate produced has been tested and was found negative for chlorides, sulfate, calcium, carbon dioxide and heavy metals. There were traces of ammonia but this was remedied by chemically-treating the feed water.

Project Title: DEVELOPMENT OF LOW-COST SOLAR STILLS FOR COMMERCIAL USE.

Name and Address of Principal Investigator: Rachel Polistico
Xavier University, Cagayan de Oro, College

Description of the Project: Fabrication of low-cost apparatus for the distillation of tap water using solar energy.

Project Cost and Source of Funding: ₱ 5,000 — Notre Dame of Marbel College

Date Started: March 15, 1980

Date of Completion (for completed projects): May 20, 1980

Other Relevant Information: All the distilled water needed by the different units of NDMC is supplied from one solar still located on the roof of the NDMC Coop Store.

Project Title: ALTERNATIVE SOURCES OF ENERGY IN AN INTEGRATED VILLAGE FOOD PROCESSING SYSTEM

Name and Address of Principal Investigator: Commodore Alfredo C. Protacio
Project Sta. Barbara, Office of the President, Sangley Point., Cavite City

Description of the Project: Alternative sources of energy (solar, biogas, windmill) will be used to supplement the energy requirement of a village food processing industry.

Project Cost and Source of Funding: ₱84,600.00 ; PSB/BATEK

Cooperating Agencies: Bureau of Energy Development (Noncon Center)

Duration or Expected Date of Completion: 1 year

Project Title: NONCON ENERGY PUBLIC INFORMATION AND PROMOTION PROGRAM

Name and Address of Principal Investigator: Laurie O. Bautista
Bureau of Energy Development,
Merritt Road, Fort Bonifacio
Metro Manila

Description of the Project: Aim is to promote the development and usage of noncon devices, to inform and gain public acceptance for nonconventional technologies. Components consists of rural seminars, briefing films, exhibits, lectures, symposia and publication of brochures.

Project Cost and Source of Funding: ₱685,000.00—BED
Cooperating Agencies: Bureau of Energy Development
Duration or Expected Date of Completion: 1 year

Project Title: SOLAR WATER HEATER PROJECT

Name and address of Principal Investigator: Bienvenido S. Arellano ; Operations Department, PNOC-EDC

Description of the Project: Twenty-five domestic-size solar water heating unit will be procured from abroad and distributed in Metro Manila and in selected provincial towns and cities. Recipients include private homes, schools and government field laboratories and health centers. Data from various sites will be collated at the end of the project. A critical assessment of the technical and economic feasibility as well as the general public acceptance of the systems will be made.

Project Cost and Source of Funding: ₱ 480,000.00; PNOC-EDC, BED/ENERCON, MLGCD

Cooperating Agencies: Bureau of Energy Development

Duration or Expected Date of Completion: 180 days

Present Status of Project: Installation of the monitoring equipment for data collection, assessment and evaluation of solar cooling under Philippine conditions are still to be completed; currently awaiting the arrival of some imported equipment which are not locally available (90% completion).

Project Title: DEVELOPMENT OF SOLAR DRYERS WITH AUXILIARY FUEL

Name and Address of Principal Investigator: Dr. Antonio Alonte; Project Sta. Barbara, Office of the President, Sangley Point, Cavite City.

Description of the Project: Improvements over the existing Mobile Solar Dryer will be developed with the addition of an auxiliary heat source fueled by agro-wastes. This enables its use during periods of low or zero insolation. The cost effectiveness of the whole system will be evaluated.

Project Cost and Source of Funding: ₱40,000.00 PSB

Cooperating Agencies: Bureau of Energy Development

Duration or Expected Date of Completion: 1 year

Present Status of Project: Laboratory model completed. Fabrication of commercial model nearing completion (75% completion).

Project Title: SOLAR DRYING TECHNOLOGY DISPERSAL FOR COUNTRYSIDE DEVELOPMENT

Name and Address of Principal Investigator: Dr. Ignacio Pablo
Institute of Nutrition, Food

Science and Technology
Philippine Women's University

Description of the Project: Solar dryers will be introduced to selected Cavite communities on a business-oriented basis. The acceptance and socio-economic impact of the technology will be evaluated. Guidelines for possible replication of the project will be outlined.

Project Cost and Source of Funding: ₱236,600.00 ; BATEK

Cooperating Agencies: Bureau of Energy Development

Duration or Expected Date of Completion: 1 year

Present Status of Project: Solar dryers were disseminated in Cavite and Batangas. Solar drying demonstration-training sessions were conducted to support the dispersal project. Testing and standardization of a modified version called the Agro-Waste Fueled Dryer is being undertaken (90% completion).

Project Title: COMMUNAL BIOGAS SYSTEM FOR SAN JOSE, BATANGAS

Name and Address of Principal Investigator: Dr. Antonio Alonte
Project Sta. Barbara,
Office of the President,
Sangley Point, Cavite City

Description of the Project: Four communal Biogas digesters will be constructed in 2 barrios of San Jose, Batangas primarily for pollution control. Secondary objectives are fuel generation for cooking and digesters sludge use for crop cultivation. Techno-economic assessments of this scale will made for possible replicability.

Project Cost and Source of Funding: ₱97,300.00 ; PSB

Cooperating Agencies: Bureau of Energy Development

Duration or Expected Date of Completion: 1 year

Present Status of Project: One modular digester for Barangay Balagtasin has been completed and is ready for testing. Construction of another digester has been started at Barangay Palanca with the concrete culvert installed in its pit and the steel gas holder fabricated (30% completion).

Project Title: TECHNO-ECONOMIC STUDY OF A COMMUNAL BIOGAS SYSTEM USING HUMAN WASTES

Name and Address of Principal Investigator: Mr. Meliton M. Ricafrente ; Economic Development Foundation, Inc., JMT Bldg., 6764 Ayala Avenue Makati, Metro Manila

Description of the Project: The project aims to gather and analyze data and information necessary for a socio-economic evaluation of the feasibility of setting up and operating a communal biogas system using human wastes.

Project Cost and Source of Funding: ₱276,800.00 ; EDF

Cooperating Agencies: Bureau of Energy Development
Duration or Expected Date of Completion: 26 months
Present Status of Project: Laboratory and bench-scale studies being carried out; design of the pilot scale model completed (40% completion).

Project Title: PILOT DENDROTHERMAL PLANT FOR RURAL POWER

Name and Address of Principal Investigator: Mr. Jose U. Jovellanos , NPC
Description of the Project: A 500 Kw wood-fired power plant system is to be installed at Barangay Paclolo, Magsaysay, Mindoro which is a managed ipil-ipil plantation to determine the techno-economic feasibility and socio-environmental impact of dendrothermal plants for rural power. The replicability of this technology will be determined from the results gathered.
Project Cost and Source of Funding: ₱ 1,500,000.00 (first year only) ; NPC/BED

Cooperating Agencies: Bureau of Energy Development
Duration or Expected Date of Completion: 5 years
Present Status of Project: A 9-meter wide, 200 meter long feeder road has been surfaced and improved to bring the total surface area to 650 lineal meters. Plant site has been cleared except for stumps to be uprooted by bulldozers prior to filling up of low places with base coarse. Plant equipment procured (30% completion).

Project Title: WIND TURBINE SYSTEM FOR PAGASA RADAR STATION AT BASCO, BATANES

Name and Address of Principal Investigator: Dr. Ramon L. Kintanar ; Philippine Atmospheric, Geophysical and Astronomical Service Administration
Description of the Project: Small scale power will be provided by wind energy in an area having a moderately high wind velocity (15kph) to supplement power presently delivered by diesel engine at Basco. Typhoon protection measures shall be studied.
Project Cost and Source of Funding: ₱200,000.00 ; PAGASA
Cooperating Agencies: Bureau of Energy Development
Duration or Expected Date of Completion: 1 year
Present Status of Project: Two Dunlite Wind-Driven Generators with an output of 2 kw each are in process of installation and testing in Basco, Batanes (80% completion).

Project Title: ATHENA

Name and Address of Principal Investigator: Mario P. Chanco ; Earthman Society
Description of the Project: Supportive of the over-all Noncon Promotions Program, seminars and exhibits to stimulate public awareness on

the potentials and proper use of noncon energy technologies will be held. Press releases, manuals and monthly magazines on noncon energy news and features and a slide show on alternative energy technologies will be made as media tools in this promotions program.

Project Cost and Source of Funding: ₱221,110.00 ; ES
Cooperating Agencies: Bureau of Energy Development
Duration or Expected Date of Completion: 1 year
Present Status of Project: Workshops and exhibits promoting noncon technologies were held. Manuals and magazines featuring different noncon promotional activities aimed at increasing public awareness have been printed and widely distributed. A slide show highlighting the potentials of alternative energy technologies is in the making (90% completion).

Project Title: PRACTICAL APPLICATION OF PRODUCER GAS FROM AGRICULTURAL WASTE RESIDUES AS ALTERNATIVE FUEL FOR DIESEL ENGINE

Name and Address of Principal Investigator: Dr. Ibarra E. Cruz
University of the Philippines
Engineering
Development. Foundation, Inc.
Diliman, Q.C.

Description of the Project: Producer gas fuel generated from agricultural wastes is utilized to run a modified dual-fueled diesel engine to provide power to an irrigation system. Economic viability and optimal scale to be determined.

Project Cost and Source of Funding: ₱ 40,000.00 ; UP, Diliman / NSDB / NIA
Cooperating Agencies: Bureau of Energy Development
Duration or Expected Date of Completion: 1 year

Project Title: DESIGN AND DEVELOPMENT OF LOW-COST WINDMILL FOR RURAL AREAS

Name and Address of Principal Investigator: Capt. Eliseo Rio, Jr.
Project Sta. Barbara,
Office of the President,
Sangley Point, Cavite City

Description of the Project: Objective is to design and test various types of windmills which use inexpensive materials suitable for low-lift irrigation and operable at low wind velocities.

Project Cost and Source of Funding: ₱57,050.00 ; PSB
Cooperating Agencies: Bureau of Energy Development
Duration or Expected Date of Completion: 1 year

Project Title: REGIONAL BIOGAS DEMONSTRATION PLANT

Name and Address of Principal Investigator: Dr. Salvador H. Escudero III
Bureau of Animal Industry Sta.
Mesa, Manila

Description of the Project: 12 household-sized biogas digesters will be constructed in various regions for promotional and demonstration purposes.

Project Cost and Source of Funding: ₱120,000.00 BAI

Cooperating Agencies: Bureau of Energy Development

Duration or Expected Date of Completion: 6 months

Project Title: LOW-COST CONTINUOUS FLOW DRYING SYSTEM USING RICE HULL AS FUEL

Name and Address of Principal Investigator: Dr. Ernesto P. Lozada
Institute of Agriculture Engineering & Technology

Description of the Project: A design and development modification of an existing continuous flow drying system using rice hull as fuel instead of original fuel oil will be realized. This will be demonstrated in NGA Centers. A package for its utilization, including financial scheme will be prepared.

Project Cost and Source of Funding: ₱159,200.00
UPLB/NGA

Cooperating Agencies: Bureau of Energy Development

Duration or Expected Date if Completion: 1 year

Project Title: MODIFICATION OF AN EXISTING DISTILLATION PLANT AS AN ANHYDROUS ALCOHOL PILOT PLANT

Name and Address of Principal Investigator: Alfredo C. Protacio
Project Sta. Barbara
Office of the President
Sangley, Point, Cavite City

Description of the Project: Attempt to convert existing but unused chemical dehydration plant into one capable of producing 300 liters of anhydrous per day.

Project Cost and Source of Funding: ₱55,355.00 SPSB

Cooperating Agencies: Bureau of Energy Development, University of the Philippines Engineering Research and Development Foundation, Inc.

Duration or Expected Date of Completion: 6 months

Project Title: (UPERDFI-PCRDFI) — COMPARATIVE PERFORMANCE TEST OF A "DUCATI IS-11" DIESEL ENGINE USING CRUDE COCONUT OIL

Name and Address of Principal Investigator: Dr. Ibarra E. Cruz
24 Viola St., U.P. Campus
Diliman, Quezon City

Description of the Project: Experimental Work With a "Ducati IS-11" Diesel Engine

In another project supported by the Philippine Coconut Research and Development Foundation, Inc. in 1977, a comparative test on a "Ducati IS-11" single cylinder diesel engine, commonly used for motor boats, was made. The results of the tests showed no significant change in the engine's performance when using either crude coconut oil or diesel fuel. In 18 runs using coconut oil, the average brake thermal efficiency was 23.7 percent at an average thermal efficiency of 23.4 percent in another 18 runs using diesel fuel at the same power output. No modifications whatsoever were made on the engine when using either fuel.

Project Cost and Source of Fundings: ₱20,000.00 (PCRDFI)
Cooperating Agencies: PCRDFI-UPERDFI
Date Started: October, 1977
Duration or Expected Date of Completion: 1 month (Nov. 1977)
Date of Completion: November, 1977
Present Status of Project: completed

Project Title: (PCA-UPERDFI) — PERFORMANCE TEST OF AN ISUZU DIESEL ENGINE USING COCONUT OIL AS FUEL

Name and Address of Principal Investigators: Dr. Ibarra E. Cruz
24 Viola St., U.P. Campus
Diliman, Quezon City

Description of the Project: Endurance Tests of an "Isuzu" Diesel Engine-Pow dered Jeepney

In a series of road tests from 1977 to 1978 to determine the performance of crude coconut oil as alternative fuel in an "Isuzu" diesel engine of a passenger jeepney, it was found that in a total of 64 trips of crude oil covering a distance of 7742 kilometers, the average of 13.1 kilometers per kilogram of diesel fuel in 12 trips covering 1121 kilometers. Based on heating values of 9,199 and 10,846 kilo-calories per kilogram respectively for crude coconut oil and diesel fuel, the vehicle travelled 11.3 kilometers per 10,000 kilocalories on coconut oil compared to 12.1 kilometers per 10,000 kilocalories on diesel oil. A somewhat better performance (7 percent longer distance travelled) was shown in favor of diesel oil. The difference, however was not significant considering the widely varying conditions encountered during the trips.

Project Cost and Source of Funding: ₱90,000.00 PCA
Cooperating Agencies: PCA-UPERDFI
Date Started: July, 1976
Duration or Expected of Completion: 1 year
Date of Completion (for completed projects): August, 1977
Present Status of Project: completed

Project Title: (PCA-UPIRC)— COMPARATIVE PERFORMANCE TEST OF A "FOUR CYLINDER 25 KVA" DIESEL ENGINE GENERATOR SET USING CRUDE COCONUT OIL

Name and Address of Principal Investigator: Dr. Ibarra E. Cruz
24 Viola St., U.P. Campus
Quezon City

Description of the Project: Comparative Test of a 25-KVA Ford Diesel-Engine Generator Set.

A 25-KVA diesel engine-generator set was installed at the Philippine Coconut Authority Pilot Plant in Alaminos Laguna for the purpose of testing its performance when fueled by crude coconut oil. The prime-mover of the generator was a 4-cylinder done in the latter part of 1977 and prolonged testing and data gathering were done during early 1978.

Results of the test show that the engine was comparable in efficiency when using crude coconut oil as fuel compared to diesel oil. At normal loads on the generator, the combined thermal efficiency when using coconut oil was as high as that for diesel, about 24 percent.

At a load of 17 kilowatts, the efficiency of the engine was 22 percent when using crude coconut oil compared to an efficiency of 23 percent when using diesel oil at a load of 18 kilowatts. At low loads however, particularly at night when not much electricity was being used in the plant, the efficiency of the engine was low. Thus, at a load of less than 2 kilowatts, which was usually the Alaminos electrical consumption for lighting at night, the diesel-engine-generator thermal efficiency went down to 4 percent. No comparable data at low load when using diesel fuel was obtained.

Although the use of crude coconut oil in a diesel engine was proven to be technically feasible, a major problem was encountered, that of the solidification of the oil in cold weather. As testing in Alaminos was done during the colder months of the year, this problem was readily observed and operation of the engine was made possible only by placing the coconut oil container in a place where it was warmed by the hot air blown from the engine radiator, Starting the engine from cold was difficult, which often resulted in draining the engine battery.

A recommendation of the study was to use a mixture of 30 percent diesel and 70 percent coconut oil to prevent solidification in cold weather.

Project Cost and Source of Funding: ₱80,000.00 (PCA)

Cooperating Agencies: PCA — UPIRC
Date Started: October, 1976
Duration or Expected Date of Completion: 1 year (September, 1979)
Date of Completion: September, 1979
Present Status of the Project: completed