Mission Brief: Project Samples

Project 1: PNOC-EDC's Existing and Proposed Wind Power Projects

NORTHERN LUZON WIND POWER PROJECT

As part of the International Atmospheric and Environmental Research Development Bureau Program of 1998, the Ministry of International Trade and Industry of Japan (MITI) commissioned the Japan External Trade Organization (JETRO) to undertake a feasibility study on wind power development in the Philippines.

LOCATION MAP

Wind conditions in the northernmost province of the Philippines were monitored and data collected were sorted and analyzed to calculate the energy gain and project the scale of wind power generation. The results of the study are contained in the *Feasibility Study on Wind Power Development in Northern Luzon, Philippines, March 1999* and indicate a total of 120 MW wind development potential in Northern Luzon.

40 MW Northern Luzon Wind Power Project, Phase 1.
This project comprises the first phase of wind power development in the area.

PNOC-EDC conducted complementary studies to validate the wind resource estimates in

Northern Luzon as well as the development cost of the first 40 Mwe. In March 2000, PNOC-EDC commissioned the services of Fr. Jose Villarin, Director of the Manila Observatory to conduct and independent study on the wind resource estimates in the area. Financial estimates were further refined to more realistic levels considering the advances in wind power generation technology in countries such as Denmark and other European countries.

The objectives of the first phase of the Northern Luzon Wind Power Project are as follows:

1. To meet the growing electricity demand in the Luzon Grid with the construction of a 40 MW Wind Power Plant Facility;

2. To contribute to the reduction of imported energy and stabilization of energy costs by developing indigenous, new and renewable energy resource; and

3. To reduce the worldwide emission of green house gases by constructing an environmentally friendly power generation facility to displace a similar capacity coal-fired plant.

Location of the Project. The Project is located in Burgos, Ilocos Norte.

Executing Agency. PNOC-Energy Development Corporation.

Scope of the Project. The Project involves the following components:

a. Engagement of consultant;

b. Construction, installation, commissioning on a turnkey basis, of a 40 MW wind farm comprising of several wind turbine generators with individual capacities equivalent to or greater than 600 KW.

c. Construction of a switchyard and a 42 km 230 kV transmission line from the wind farm switchyard at Burgos to the nearest NPC substation in Laoag, Ilocos Norte.

Project Financing and Cost Estimate. The project is being carried out using funds provided by the Japan Bank for International Cooperation under a Tied Loan amounting to 5,857 Million Japanese Yen. The balance of the project financing will be shouldered by PNOC-EDC.

The project is estimated to cost $55 Million , comprising of a Forex portion of $48 million and a local portion of $7 million.

Implementation Schedule. The project is expected to be completed in May 2005.

ECC Clearance and other Requirements. DENR issued an Environmental Compliance Certificate for the project on May 5, 2000. All necessary local government and regional approvals have been secured. Negotiations for acquisition of right-of-way for the transmission lines are ongoing and are expected to be substantially completed by the end of 2002.

Electricity Sales. PNOC-EDC plans to sell the electricity generated by the wind farm to the Luzon grid by participating in the Wholesale Energy Spot Market and to local cooperatives.

Status to Date. The JBIC loan agreement for the project was signed on March 28, 2002 and PNOC-EDC is currently in the process of finalizing prequalification documents for the Wind Farm and the Transmission Lines Turnkey Contracts. It expects to issue these documents by mid-October 2002.

42 MW Northern Luzon Wind Power Project, Phase 2.

Scope of the Project. Scope of the project includes the following:

a. Construction, installation and commissioning of 40 MW Wind Farm comprising of several Wind Turbine Generators of individual capacities equivalent to or greater than 600 KW.
b. Construction of 10 km 115 kV high tension overhead line and associated facilities;
c. Engagement of consultant services.

Cost Estimate. Total Project cost is estimated at US$49.27 million. The foreign component is equivalent to US$36.96 million while the local component is equivalent to US$12.31 million.

Implementation Schedule. The project is expected to be commissioned by 2006.

Current Status. PNOC-EDC is currently collecting wind data in order to properly assess energy capacity of Phase 2 for a feasibility study. Several offers to develop Phase 2 have been received by PNOC-EDC and are under consideration.

40 MW Northern Luzon Wind Power Project – Phase 3

No scheduled activity.

OTHER PROSPECTS INVESTIGATED BY PNOC-EDC

PNOC-EDC has also investigated other prospects in Southern Philippines as follows:

Nubenta, Red Mountain, Surigao del Sur

The site is located approximately 300 meter masl in the mining area near Carrascal. It is accessible from a highway under construction and further made accessible by exploration roads constructed by mining companies. The terrain is mostly flat, with minimal vegatation, causing minimal turbulence to wind flow in the area. It overlooks the Philippine Sea from the southeast and the northwest directions. Some permanent deformations of small trees indicate that the wind typically comes from the northeast direction. Ground measurements yielded wind speeds of 8-11 m/s, which, by industry standards, has good to excellent wind power potential. This, however has to be validated by at least one year of wind data gathered from the site.

Transmission lines of the local cooperative also pass through the candidate site, making it more attractive for development.

Ayoke Island, Cantilan, Surigao del Sur

Ayoke island's community of about 75 households have never had the benefit of electricity. Mostly fishermen, they rely on firewood and kerosene lamps for their cooking and lighting needs, respectively. The island is accessible only by a 45 minute boat ride from Cantilan. The highest point of the island serves as a lookout point. Wind blows from the north-northeast direction in the last to first quarter of the year. There are no obstacles to the flow since the site is the highest point of the island and overlooking the waters in all directions.

The site, off-grid, with sufficient energy demand and good wind energy potential is an excellent candidate for a wind-diesel hybrid system. A collaborative effort is considered possible to develop a small wind-diesel hybrid system for the island. This however requires a feasibility study to apply for a loan with the Development Bank of the Philippines (DBP) which has a loan facility available for projects like this.

Tagkiling, Mt. Antikala, Agusan del Norte

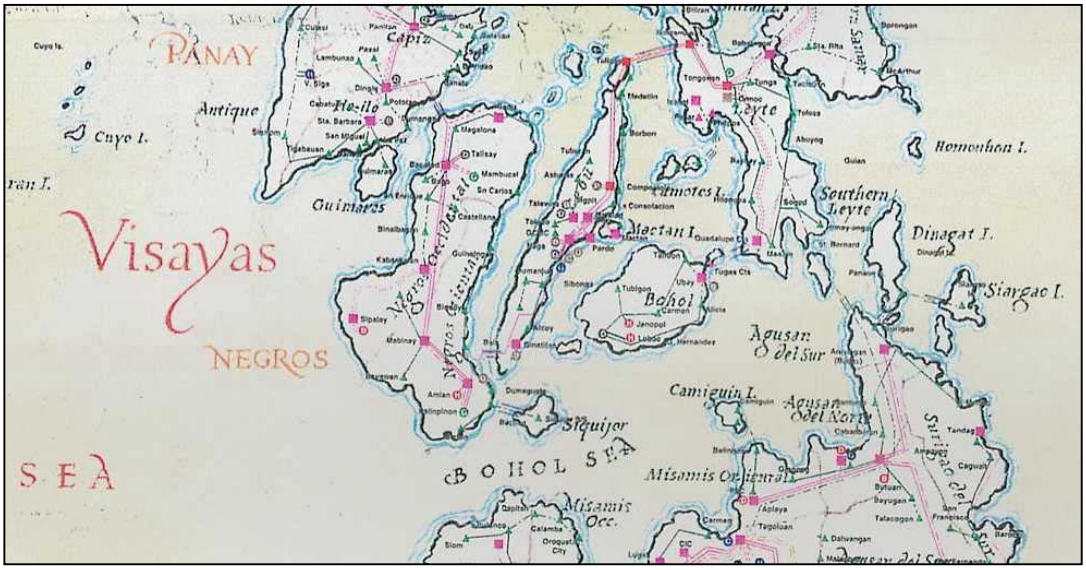
The site is located at approximately 300-400 masl and shows visible signs of strong, consistent wind. Access to the site is made easy by a new road being constructed across the mountain. Ground measurements of wind speeds at the time of visit indicated speeds of 14-18 m/s with maximum gusts of 20 m/s. By industry standards, the site has very good potential for production of electricity using wind turbine generators. Development cost, should the site be proven to have wind potential, is also expected to be at an acceptable level due to its proximity to access roads and transmission lines.

Rubenian, Basilisa, Dinagat Island, Surigao del Norte

The site is located in the municipality of Basilisa. It is approximately 200-250 masl with mild slopes and is accessible via the highway being constructed through the mountains. Observed wind speeds at ground level are 9-12 m/s, noteworthy of long term investigation for wind farm development. Currently, the island demand of 1.5 MW is being supplied by diesel gensets operated by NPC and is unreliable , resulting in regular brownouts. Conceivably, a wind farm of 2-3 MW could substantially improve the power supply scenario on the island and increase overall productivity.

Siargao Island, Surigao del Norte

This island has several sites (Burgos; Taligrapo; Cloud 9, General Luna; and Dapa) which have very good potential for wind farm development. Although the island currently gets its power from the mainland through submarine cables, the installation of wind farms on the island will increase reliability and perhaps serve to lower electricity costs.



Location Map.

Project 2: Pagbilao Wind Project

BRIEF PROJECT HISTORY

Since the presentation of the Philippine Wind Atlas by Preferred Energy Inc. (PEI) in 2000, local companies have been aware of the potential for wind power in many areas of the country. Trans-Asia Renewable Energy Corporation has been following the local and international wind sector with interest. It has met with several foreign wind project developers and wind turbine manufacturers.

Trans-Asia Renewable has decided to undertake its own wind project by looking at wind potential from the point of view of the power market. Trans-Asia Renewable will identify the wind areas close to the backbone transmission line.

Trans-Asia Renewable engaged Alberto R. Dalusung III of PEI to initiate its wind resource assessment activity.

TECHNICAL ASPECTS

Trans-Asia Renewable has undertaken a one-month wind monitoring activity in the project site. It validated the low season wind regime as estimated by the Philippine Wind Atlas or a wind speed of about **4 meters per second (m/s)**. The monitoring was done using industry standard equipment (10 meter tower; Second Wind data logger (Nomad), sensors, and related accessories; WindSite software). The wind speed and direction were measured every second, averaged every 15 minutes, and logged.

The monitoring activity also recorded the effect of a typhoon in July 20 with winds coming from the NNW with an average velocity of 8.53 m/s with a maximum 15-minute average velocity of 14.6 m/s.

Another measurement is currently being undertaken to measure the high season regime in the site. This is only a week-long measurement intended to verify the predicted wind speed.

The Philippine Wind Atlas estimates at least 6 square kilometers (600 hectares) with more than 400 watts per square meter of swept turbine blade area. With a wind-energy capacity index of 6.9 MW per square kilometer the projected capacity is **40 MW** using 80 units of 500 kW wind turbines. Wind turbines have grown in size and efficiency since the conduct of the Philippine Wind Atlas with current wind farms using megawatt-size turbines.

Project Location

Trans-Asia Renewable has identified a potential wind location in Pagbilao, Quezon Province. The measurement site is just outside of the Quezon National Park across the national highway. The measurement done should also be applicable to the national park.

Project Objectives

1. To support the Philippine energy policy promoting commercialization of new and renewable sources of energy
2. To promote the use of wind energy which produces zero emission, renewable and abundant in the Philippines
3. To promote an energy source, which offers the flexibility to be developed incrementally as power demand grows avoiding the need for long lead time and high first cost investment requirements associated with other energy sources
4. To maximize the benefits from global and regional partnerships
5. To maximize the support of European technology and finance companies

Project Scope

Trans-Asia Renewable intends to develop the full potential of the site, i.e. 40 MW in the long run. However, the economics may indicate a phasing of development staring with an initial development in the scale around 10 MW.

Project Cost Estimate

Current wind farm projects are estimated at around $1 Million per MW. Typical wind energy costs range from 4 to 6 US cents/kWh in the United States to about 7 US cents/kWh in India. Cost trend is downward.

Implementation Schedule

1. Site resource assessment
   - Trans-Asia Renewable resource assessment (Done)
     - Identify promising site(s) from maps and other sources
     - Obtain hourly wind speed and direction data
       - "Low" season (June-July)
       - "High" season (October-November)
   - With Technology Partner (Proposed)
     - 12-month wind monitoring to verify wind availability
     - Undertake detailed site surveys to identify potential tower locations
     - Micrositing (detailed measurements of wind speed at proposed tower locations)

2. Secure access to land

3. Determine the following parameters and undertake pre-FS
   - Applicable investment incentives
   - Applicable environmental incentives (eg. CDM, Type 2)
   - Potential wind turbines
   - Power sales and revenue forecast
   - Cost items
     - Substation
     - Transportation
     - Customs and other fees
     - Foundations (depending on soil conditions)
     - Crane fees and labor cost

4. Propose project to potential partners
   - Wind power developers
   - Wind turbine suppliers
   - Electric distribution company
   - Other private investors

5. Negotiate power purchase agreement with potential power customers
   - TransCo
   - Distribution Utility
   - Bulk Power Users

6. Complete permitting requirements
   - National, Provincial, Municipal, Barangay levels
   - Environmental, health and safety, land ownership, etc.

7. Secure project financing from interested investors
   - Equity and debt

8. Construction (9-18 months depending on size and commissioning schedule)
   - Civil works
     - Lay roads
     - Pouring of tower foundations
   - Underground electrical work
   - Transmission and substation
   - Assembly and erection of turbines
   - System integration

9. Operation (15 years)

MARKET

The ultimate market for the project is the national grid. It would help if the government can finalize its intension to initiate a parallel market for NRE projects.

The distribution utility is QUEZELCO I that is a good electric cooperative with over 24 MW of peak demand. The measurement site is part of a 13-hectare privately-owned land. Using efficient new machines, the site alone may be able to support close to 1 MW which may feed into the distribution system.

Impact

The project will provide a clean and significantly large-scale application of NRE by the private sector. Being a wind power project, it can attract new players worldwide that are looking for clean power projects to support either as multilateral/bilateral agencies or private developers.

Project 3: Sojoton Wind Project

BRIEF PROJECT HISTORY

The Sojoton Wind Project was originally a project of the Green IPP (GRIPP), a joint initiative of the Philippine Rural Reconstruction Movement (PRRM) and Greenpeace. GRIPP aims to undertake early development of clean power projects to be eventually turned over to the private sector for implementation. Since the presentation of the Philippine Wind Atlas by Preferred Energy Inc. (PEI) in 2000, local companies have been aware of the potential for wind power in many areas of the country. **Trans-Asia Renewable Energy Corporation** has been following the local and international wind sector with interest. It has met with several foreign wind project developers and wind turbine manufacturers. Through PEI, Trans-Asia Renewable came to know of the GRIPP project and the specific opportunity in wind power development of Sojoton Point. PEI and Greenpeace are preparing a document whereby GRIPP will officially turn over the Sojoton Point development to Trans-Asia Renewable.

TECHNICAL ASPECTS

GRIPP engaged Silver Navarro to undertake a one-week wind monitoring activity in the project site. The monitoring indicated much higher speeds than estimated by the Philippine Wind Atlas. The monitoring was done using industry standard equipment (10.7 meter tower; Second Wind data logger (Nomad), sensors, and related accessories; WindSite software). The wind speed and direction were measured every second, averaged every 15 minutes, and logged. The monitoring activity measured an average wind velocity of **8.9 m/s** at a tower height of 10.7 meters. The Wind Atlas estimated the wind speed at 8.3 m/s at a height of 30 meters. Another measurement is scheduled in May 2003 by Trans-Asia Renewable during the low wind season. This will only be a week-long measurement intended to verify the predicted wind speed.

The Philippine Wind Atlas estimates at least 42 square kilometers in the Cauayan-Sipalay area with more than 400 watts per square meter of swept turbine blade area. With a wind-energy capacity index of 6.9 MW per square kilometer the projected capacity of the wind site is **289 MW** using 80 units of 500 kW wind turbines. Wind turbines have grown in size and efficiency since the conduct of the Philippine Wind Atlas with current wind farms using megawatt-size turbines.

Project Location

Sojoton Point is in Sitio Sojoton, Barangay Caliling, Municipality of Cauayan, Negros Occidental. It is 89 meters above sea level. The wind monitoring system was installed in the following location: N 9 58‘ 25.9" E 122 27‘ 07.5".

Project Objectives

- To support the Philippine energy policy promoting commercialization of new and renewable sources of energy

- To promote the use of wind energy which produces zero emission, renewable and abundant in the Philippines
- To promote an energy source, which offers the flexibility to be developed incrementally as power demand grows avoiding the need for long lead time and high first cost investment requirements associated with other energy sources
- To maximize the benefits from global and regional partnerships
- To maximize the support of European technology and finance companies

Project Scope

Trans-Asia Renewable intends to develop the *market* potential of the site within Negros Island, or about 30 MW in the long run. However, the economics may indicate a phasing of development staring with an initial development in the scale around 5-10 MW.

Project Cost Estimate

Current wind farm projects are estimated at around $1 Million per MW. Typical wind energy costs range from 4 to 6 US cents/kWh in the United States to about 7 US cents/kWh in India. Cost trend is downward.

Implementation Schedule

1. Site resource assessment
    - GRIPP resource assessment (Done)
        - Identify promising site(s) from maps and other sources
        - Obtain hourly wind speed and direction data
            - "Low" season (scheduled for May 2003)
            - "High" season (November 2001)
    - With Technology Partner (Proposed)
        - 12-month wind monitoring to verify wind availability
        - Undertake detailed site surveys to identify potential tower locations
        - Micrositing (detailed measurements of wind speed at proposed tower locations)
2. Secure Access to Land
3. Determine the following parameters and undertake pre-FS
    - Applicable investment incentives
    - Applicable environmental incentives (eg. CDM, Type 2)
    - Potential wind turbines
    - Power sales and revenue forecast
    - Cost items
        - Substation
        - Transportation
        - Customs and other fees
        - Foundations (depending on soil conditions)
        - Crane fees and labor cost
4. Propose project to potential partners
    - Wind power developers
    - Wind turbine suppliers
    - Electric distribution company

- Other private investors

5. Negotiate power purchase agreement with potential power customers
   - TransCo
   - Distribution Utility
   - Bulk Power User
6. Complete permitting requirements
   - National, Provincial, Municipal, Barangay levels
   - Environmental, health and safety, land ownership, etc.
7. Secure project financing from interested investors
   - Equity and debt
8. Construction (9-18 months depending on size and commissioning schedule)
   - Civil works
     - Lay roads
     - Pouring of tower foundations
   - Underground electrical work
   - Transmission and substation
   - Assembly and erection of turbines
   - System integration
9. Operation (15 years)

MARKET

The medium-term market for the project is the Negros regional grid with over 150 MW of peak demand. Negros Island is connected via submarine cable to the islands of Cebu, the main power market in the Visayas, and Panay.

If the government can finalize its intension to initiate a parallel market for NRE projects, the Cebu-Negros-Panay grid can provide a rich source of NRE energy from wind and biomass (through bagasse from the sugar centrals in Negros and Panay).

The distribution utility is NOCECO that is a good electric cooperative with over 25 MW of peak demand and 98% collection efficiency (2001 data).

IMPACT

The project will provide a clean and significantly large-scale application of NRE by the private sector. Being a wind power project, it can attract new players worldwide that are looking for clean power projects to support either as multilateral/bilateral agencies or private developers.

Project 4: Development of 12 MW Mini-hydro Project Along Dapitan River in Zamboanga del Norte

PROPONENT : SMITH BELL RESCO

BACKGROUND

The Philippines - Department of Energy Mini-Hydro Division had conducted a rapid assessment of the Dapitan River basin located in the province of Zamboanga del Norte, island of Mindanao in south-western Philippines. The rapid assessment pointed to the great potential of harnessing the water power of the cascading Dapitan River. The study being preliminary however, could only provide basic information for pursuing a detailed feasibility study (DFS) which is necessary to establish the river's power generating capacity and substantiate the anticipated investment decision of **SMITH BELL RESCO,** an independent power producer.

Pursuing the development of the hydro project is deemed necessary in support of the projected increase in power demand in the province including the power requirement of the Zamboanga del Norte – Provincial Agro-Industrial Center (ZN-PAIC), soon to be on the ground.

The power to be generated by the hydro plant shall be sold to the local electric cooperative, ZANECO (Zamboanga del Norte Electric Cooperative), with whom a Memorandum of Understanding has been forged by Smith Bell. The MOU expresses ZANECO's interest to purchase the power to be generated by the hydro plant to be put up, operated and owned by Smith Bell. A Power Purchase Agreement which shall detail the terms and conditions of the sale / purchase of power shall be executed after the detailed feasibility study has been completed. The Provincial Government of Palawan which has been very supportive of the project has given its commitment to see the project through.

Physical characteristics of the province

Zamboanga del Norte is situated in the Western Border of Mindanao and drops in the northwestern rim of the Zamboanga Peninsula with more or less 400 kilometers of irregular coastline facing Sulu Sea. It is composed of 25 municipalities, two (2) component cities and 690 barangays over an area of approximately 720, 594 hectares. Among its municipalities and cities, Sibuco has the biggest land area of 79,554 hectares while the smallest municipality is La Libertad with an area of 5,460 hectares.

The province of Zamboanga del Norte belongs to the fourth type of climate that is, mild or moderate, where rainfall is evenly distributed throughout the year. Wet season normally starts in May and ends in January, while dry season starts in February until April. The province is beyond the typhoon belt areas, which gives the province a comparative advantage on farm production.

Need for feasibility study

At the moment, the next necessary step is to do a detailed feasibility study which will determine the power generating capacity of the proposed hydro site. **SMITH BELL RESCO** is in the

process of putting together the needed financial resources to carryout the detailed FS with the assistance of a group of consultants. If current negotiation for FS funding reaches closure in the next couple of months, the study is expected to be completed within 2001.

Initial characterization of the hydro sites

Based on the preliminary data gathered by the Department of Energy in the rapid assessment of the hydro site it conducted, the Dapitan River has a potential aggregate installed capacity of 11.8 Megawatts (MW). This is broken down into: **Lower Dapitan River** (located at barangay El Paraiso, municipality of La Libertad) = **3.8 MW; Middle Dapitan River** (located at barangay New Siquijor, municipality of Mutia) = **4.4 MW;** and **Upper Dapitan River** (located at barangay G. Bergamo, municipality of Mutia) = **3.6 MW.**

UPPER DAPITAN RIVER MINI-HYDRO SITE

The proposed project site is located at barangay G. Bergamo, Mutia, Zamboanga del Norte. The municipality of Mutia is 30.5 km from Dipolog City accessible through the national road while barangay Bergado from the town proper is about 10 km. of gravel road.

Mutia has rainfall that is evenly distributed throughout the year. With a gross head of 65 meters and a net head of 50 meters, the estimated installed capacity is 3.6 MW while the firm capacity is 2.6 MW. The annual potential energy is computed at 27.6 GWh while the net annual energy is calculated at 23.4 GWh.

The watershed is in the forested park of Mt. Malindang National Park and Lake Duminagat. It is composed of patches of coconut plantations and farmlands. The area is moderately sloping to hilly and the local surface geology is dominated by extrusive rocks with bedrock exposures and predominance of cobbles and boulders with few deposits of fine sand.

The proposed mini-hydro power system is of the run-of-river type.

The power to be generated by the hydro plant shall be purchased by the Zamboanga del Norte Electric Cooperative (ZANECO). In this regard, a Memorandum of Understanding has been signed between SMITH BELL RESCO and ZANECO where the latter has expressed interest to buy all the power to be generated from the three(3) hydro sites.

The estimated project cost is US$ 5.7 million with a specific investment cost of about US$1500 per installed kW.

1.2 MIDDLE DAPITAN RIVER MINI-HYDRO SITE

The proposed project site is located at barangay New Siquijor, municipality of Mutia, Zamboanga del Norte. The municipality of Mutia is 30.5 km from Dipolog City accessible through the national road while barangay Siquijor from the town proper is about 10 km. of gravel road.

With a gross head of 60 meters, and a net head of 50 meters, the estimated installed capacity is 4.4 MW while the firm capacity is 2.2 MW. The annual potential energy is computed at 31.3 GWh while the net annual energy is calculated at 26.6 GWh.

The watershed is in the forested area of Mt. Malindang National Park and Lake Duminagat. It is composed of patches of coconut plantations and farmlands. The area is moderately sloping to hilly and the local surface geology is of andesite volcanic rocks with bedrock exposures and predominance of cobbles and boulders with few deposits of fine sand.

The proposed mini-hydro power system is of the run-of-river type.

The estimated project cost is US$ 6.6 million with a specific investment cost of about US$ 1500 per installed kW.

LOWER DAPITAN RIVER MINI-HYDRO SITE

The proposed project site is located at barangay El Paraiso, municipality of La Libertad, Zamboanga del Norte. The municipality of La Libertad is 40 km from Dipolog City accessible through the national road while barangay El Paraiso from the town proper is about 4 km. of provincial (gravel) road

The site has the same rainfall characteristics as the upper and middle Dapitan River. The gross head is 43 meters and the net head is 33 meters. Installed capacity is computed at 3.8 MW while the firm capacity is estimated at 1.7 MW. The annual potential energy is calculated at 24.6 GWh while the net annual energy is calculated at 20.9 GWh.

The watershed is in the forested area of Mt. Malindang National Park and Lake Duminagat. It is composed of patches of coconut plantations and farmlands. The area is moderately sloping and the local surface geology at the diversion/intake area is composed of extrusive rock, boulders, cobbles and sand while the powerhouse/headrace area is composed of recent alluvium, clay soil.

The proposed mini-hydro power system is of the run-of-river type.

The estimated project cost is US$ 5.4 million with a specific investment cost of about US$ 1500 per installed kW.

CURRENT PROVINCIAL POWER SUPPLY AND DEMAND SCENARIO AND FUTURE OUTLOOK

ZANECO purchases the power it distributes from the National Power Corporation (NPC). At normal condition, eighty percent (80%) of NPC-generated power comes from Agus Hydroelectric Complex in Iligan City and twenty percent (20%) from diesel power plants. At the moment, the total energy demand of ZANECO is 15 MW.

Load Demand Forecast

The load demand forecast of ZANECO (Figure 1) projects an increasing demand through the coming years and thus will be able to absorb the output of the 11.8 MW mini-hydro power plant.

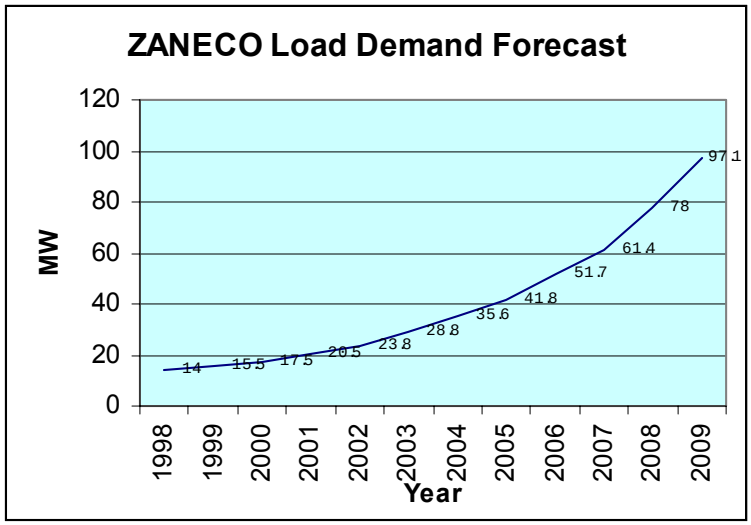


Figure 4. Load demand forecast of ZANECO until year 2009.

Project 5: Rural Electrification of EASTERN SAMAR

PROPONENT : SMITH BELL RESCO

A. BACKGROUND

In a country where there are still close to 8,000 unenergized *barangays* in the countryside, most of which are too far from the grid to be connected, NRE has emerged as a cost-effective as well as environment-friendly solution. Government and the private sector, which had traditionally committed almost negligible levels of financial and institutional resources to the NRE sector, are now aggressively pushing for the NRE commercialization and more widespread utilization of technologies like solar, wind, biomass, and hydro, and their hybrids.

B. PROJECT OBJECTIVES

The main objective of the project is to energize several unelectrified barangays in the province of Eastern Samar using NRE sources, particularly areas not programmed for connection to the grid over the medium to long-term. This is in consonance with the Philippine Department of Energy's (DOE) "O Ilaw" rural electrification program, which is anchored on the government's commitment to provide greater opportunities and benefits to the underprivileged and which aims to attain 100% barangay-level electrification by the year 2004 either through grid extension or NRE-based electrification. A livelihood program will be pursued alongside the electrification project to introduce additional sources of income that will help ensure project sustainability and promote economic activity and growth in the selected areas.

C. PROJECT DESCRIPTION

Target Area(s). Eastern Samar has been selected as the target area for this endeavor. A coastal province in Eastern Visayas (Region 8), it has 23 municipalities and 597 barangays, of which 181 are classified as urban and 416 rural. Because of its rugged terrain, most of its towns are found along the coast, making inhabitants highly vulnerable to weather disturbances like typhoons especially in the months of September and October.

Eastern Samar is richly endowed with natural resources. Agricultural land products include palay, corn, coconut (used mainly for copra production) vegetables, root crops, and fruits. The province also has an abundance of prawns, shrimps, and milkfish, accounting for more than 18,000 metric tons fish production per year. In terms of manufacturing and processing, principal products include copra, shell crafts and root crops.

Despite this abundance of natural resources, however, underdevelopment remains a formidable issue for the province. Agro infrastructure remains weak (resulting in low agricultural productivity) and basic social services still require substantial investments. Availability of safe drinking water is still an issue in many municipalities, given the limited number of community water systems and substantial number of households still depending on tubed or pipe wells for their water supply. Access to electricity also remains one of the biggest obstacles to development, with majority of households in these barangays continuing to rely on kerosene as their main fuel for lighting.

Energy/Power Situation. At present, power supply in Eastern Samar is supplied by the NPC and distributed by the Eastern Samar Electric Cooperative (ESAMELCO). As of September 2000, the province posted a 55% energization rate. The main source of power is the Tongonan geothermal plant in Tongonan, Leyte. ESAMELCO distributes power through 2 substations (Taft, which serves 8 municipalities and Cabong which serves 11 municipalities) and the Amanjuray mini-hydro plant which serves 2 municipalities. Total provincial demand is pegged at 6.0 MW.

Based on the latest schedule of the National Electrification Administration (May 2000), a total of 280 barangays in Eastern Samar are being targeted for electrification between the year 2000 and 2004. Of this figure, 40 are programmed for NRE-based electrification while the remaining 240 will be connected to the grid.

Resource Availability. Preliminary information about Eastern Samar reveal strong potential for a number of renewable energy technologies. The DOE estimates Eastern Samar as having 144 watts/m2 solar energy potential. In terms of biomass, Eastern Samar is estimated to have 10,548 MT of ricehull and 608,648 MT od coconut residues that can be harnessed.

In the most recent inventory of potential minihydro systems in the country conducted by the DOE Minihydro Division, a total of ten sites yielding an estimated 31,830 kW of minihydro energy were identified Eastern Visayas. These include:

SITE	CAPACITY (in kW)
Amandaraga Falls	9,300
Candacan	130
Borongan Falls	1,400
Bihid Falls A	7,400
Suribao Falls	1,900
Taft	9,000
Oras	250
Dolores	2,000
Kagmanaba Falls	150
Masak-Pasak Falls	300

Nine sites yielding 632 kW of micro-hydro energy were also identified by the DOE in an earlier inventory.

On wind, Eastern Samar has been identified to possess average wind speed of 6-7 m/s.

One of the activities that need to be done in the preparatory stage of the project is the conduct of a more **detailed resource assessment** to establish which is the most technically and financially viable among the above mentioned renewable energy options.

Stakeholder Consultation. It is essential that during the project preparation stage, extensive consultations are carried out with the different stakeholders in the project. This would include the local partner(s), the concerned LGUs, any community organizations operating in the area, and of course the beneficiaries. The rural electric cooperative (ESAMELCO) possibly thru a local Barangay Power Association (BAPA)[1] is being eyed as a potential local partner of SB-RESCO for the implementation of the project – primarily because it holds the franchise over the area (and thus has a better knowledge of the local situation) and also because it has the required management experience and a staff of technical people who can be easily trained in the proper operation and maintenance of the NRE systems.

Market Assessment/ Site Selection. The specific barangays under this project will be chosen from among the forty barangays already pre-identified by the NEA/DOE for NRE-based electrification. Criteria for selection (which shall be carried out in coordination with the NEA/DOE) shall include residents' capability and willingness to pay, current energy consumption patterns, accessibility, and overall economic development potential. These will be determined using market studies that have already been conducted[2] plus a more detailed survey/study that will be carried out as part of this project. Close coordination with ESAMELCO is also crucial in this aspect of the project as they have a better idea of the local situation in the unenergized areas listed by the DOE/NEA.

FINANCING SCHEME.

On the matter of funding for the main project, various options will be explored, e.g. seeking financing from formal lending institutions like the Development Bank of the Philippines (DBP) or the Landbank, which offer softer terms for developmental projects such as this vis-a-vis commercial banks.

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[1] BAPAs are organized by rural electric cooperatives in areas they serve as their local representative. BAPA officials are recruited from the locality and therefore have good knowledge of the local situation. A close working arrangement between SB-RESCO and the BAPA would be the ideal situation since the REC has a wider scope of responsibilities and would probably prefer a more supervisory role in the project, and have the day to day concerns handled by its local representative.

[2] In 1999-2000, DOE conducted a market study and "rapid rural assessment" (RRA) of barangays throughout the country. The market study included 9 barangays In Eastern Samar being considered for NRE electrification, including: Baras, Camantang, Carayacay, Casuguran, Catumsan, Pagbabangnan, Sta. Rosa, Abijao, and Taytay. The RRA, meanwhile, covered 30 barangays. The results of this market study and RRA will be useful in selecting the final site for this project.

At the same time, a co-financing scheme will be pursued with the Department of Energy, which has allocated some funds for the set-up of NRE systems in the nine barangays identified for NRE electrification but, as pointed out earlier, on a very limited scale (i.e. ten installations per barangay) and usually limited to lighting. The DOE infusion will serve to lower the cost of the systems to be installed.

IMPLEMENTATION PHASE

Basic Approach. A RESCO or renewable energy service company approach will be utilized for the main project whereby the focus will be on the provision of energy service, rather than kilowatt-hour sales. The value of said service shall be determined by the customers' willingness and ability to pay (and will therefore not involve a regulated price or uniform tariff). This is the ideal set-up for barangays which are isolated from the formal energy supply network and have no near-term access to an electric power grid.