# FEASIBILITY STUDY

Hybridizing Existing Diesel Power Plants with Renewable Energy

## The case of Cobrador Island, Romblon, Romblon

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## **RURAL ELECTRIFICATION IN THE PHILIPPINES**

### **Overview**

- The National Electrification Administration is mandated to implement the Rural Electrification Program through rural Electric Cooperatives (ECs).
- Supply of power on the national grid are generated by various power generators (government and privately-own)
- 120 ECs and 19 franchised private distribution utilities in the country distribute electricity in their franchised areas.
- The National Power Corporation-Small Power Utilities Group (NPC-SPUG) operates diesel generating facilities to serve off-grid areas, while ECs distribute the electricity to off-grid consumers.



## **ABOUT ROMELCO**

### PROFILE

- Romblon Electric Cooperative, Inc (ROMELCO) is a nonstock, non-profit corporation organized on June 14, 1989 under R.A. 6038 as amended by P.D. 269 (NEA Charter).
- Franchise area covers 4 municipalities in the Romblon Province, namely Romblon, Magdiwang, Cajidiocan and San Fernando.
- Main office location: Barangay Capaclan, Romblon, Romblon
- Medium size EC
- Peak Load: 2.8 MW
- Source of Power: Diesel Genset (NPC-owned) and ROMELCO owned 900kW hydro power facility



## **OFF-GRID ELECTRIFICATION IN THE PHILIPPINES**

## **Our Challenges**

- The archipelagic characteristic of the Philippines is a big hurdle for rural electrification
- Only 22 out of 233 off-grid areas enjoy 24/7 electricity service
- 70% of the areas have only 8 hours or less of electricity service
- Maintaining diesel-based power plants entail substantial resources due to high fuel, transportation and handling costs
- As of 2014, about 83% (including underenergized) of the households in the franchise area of ECs have electricity.
- The government aims to attain 90% household electrification level by 2017





## **RE HYBRID SYSTEM FEASIBILITY STUDY**

The feasibility study aimed to show the viability of putting up RE-based hybrid systems that will be operated and managed by Electric Cooperatives in their franchise areas.

**Expected Outputs:** 

- Least Cost Electrification Option using renewable energy that can
  - Extend electricity service hours to 24/7
  - Provide reliable power to households and support productive uses
- Bankable Feasibility Study that can serve as basis for implementation
  - propose feasible institutional arrangements
  - propose suitable technical implementation options
  - propose financing options including private sources
- Proof of commercial viability
- A model for Electric Cooperatives that are willing to take over the generation function in off-grid areas within their franchise
- A sound alternative solution to off-grid electrification using low carbon and indigenous energy resources





#### BARANGAY COBRADOR MUNICIPALITY OF ROMBLON PROVINCE OF ROMBLON

## **GENERAL INFORMATION**

#### **DESCRIPTION:**

One of the island barangays in municipality of Romblon, Romblon Province

**NO. OF HHs: 234** 

LAND AREA: 2.64 sq. kms.

**POPULATION: 983** 



MEANS OF ACCESS: around 45 minutes by boat from Romblon town



## **SOCIO-ECONOMIC PROFILE**

#### **MEANS OF LIVELIHOOD:**

Fishing, boat making, mat making, employment, small-scale marble industries

#### **BARANGAY FACILITIES:**

- 1 elementary school
- 1 barangay health station
- 1 day care
- 15 streetlights

#### SOURCE OF POTABLE WATER:

Rain collector, open dug well, deep well









## **ENERGY PROFILE**

#### SOURCES OF ENERGY FOR LIGHTING/POWER:

- 15 kW genset through ROMELCO
- Hours of operation 8 hours (4-6 a.m., 5-11 p.m.)
- 138 out of 234 households have electricity (59%)
- Distribution line single phase
- Tariff is Php30/kWh (USD0.67)
- True cost is Php68/kWh (USD1.33, 2014 average)







### LOAD ANALYSIS

#### Load Forecast for Cobrador

Year	2014	2015	2016	2017	2018
Energy sales, kWh	10,979	12,331	40,894	45,922	50,992
Peak Demand, kW	10	12	13	15	17
Daily Demand, kWh	30	34	112	126	140
Operating Hours	8	8	24	24	24
Sales growth rate, %		11%	70%	11%	10%



### **Proposed Technical Configuration**

#### **Optimization results for Cobrador**

Genset	15 kW	
PV	30 kW	
Battery	178 kWh	
PCS	25 kW	
Initial Capital Cost	USD405,700	
Operating Cost – 1 <sup>st</sup> year	USD25,833	
Generation – 1 <sup>st</sup> Year (kWh)	RE: 32,715 Diesel 10,661	
RE Fraction	38%	

The optimal design was configured using HOMER (Hybrid Optimization of Multiple Energy Resources) software, which was originally developed by NREL and now licensed to HOMER Energy, LLC.



#### MAJOR INCENTIVES FOR RENEWABLE ENERGY IN OFF-GRID AREAS

**Universal Charge for Missionary Electrification (UCME)** 

UCME = (TCGR – SAGR) x MES TCGR = ERC-approved True Cost of Generation Rate, P/kWh SAGR = Applicable Subsidized ERC-approved Generation Rate in the area, P/kWh MES = Metered Energy Sales, kWh

Cash Incentive of Renewable Energy Developers for Missionary Electrification

Cash Incentive = 0.5 x (TCGR - SAGR) x MRES MRES = Metered RE Energy Sales, kWh

#### Income Tax Holiday (ITH) & 10 % Corporate Tax Rate

Income taxes exempt for the first 7 years of commercial operations 10 % of Corporate tax rate after 7 years (reduced from the regular 30 percent)



### **Financial Analysis Results**

	Cobrador
Investment cost (USD)	405,700
Renewable Energy Fraction (%)	38%
Cost of Energy (U\$)	0.70
SAGR (U\$)	0.1464
Difference (to be subsidized from UCME)	0.5546
Total Cash Incentive (U\$)	375,560
Project IRR (%)	6.2%
Payback Period (Yr)	12.59

With RE Generation



Additional Revenue through Cash Incentive



### **Institutional Arrangements**

	EC Subsidiary		
Type of Organization:	<b>Business Model:</b> EC shall apply for revision of the SEC registration of its subsidiary company to include the operation of other RE Projects and RE hybrid systems in the company's purpose.		
Operational Set- up:	QTP - EC-Subsidiary will register as a QTP to handle both power generation and distribution in Cobrador Island, Romblon.		
Cost Recovery	QTP can charge subsidized approved retail rate as approved by ERC and access the UCME to ensure full cost recovery.		
Access to RE Act Incentives	EC will apply for RE Service Contract with DOE to avail of both fiscal and non-fiscal incentives under RE Act, including, among others, duty-free importation for equipment, VAT exemptions for power sales, income tax privileges and cash incentives for RE generation in missionary areas.		



## CONCLUSIONS

- Hybridizing the existing diesel gensets with RE is a good option for electrification of island communities
- Hybridizing the existing diesel power plant is financially viable due to subsidies and cash incentives provided by government
- Project benefits include:
  - Reliable power source for the Cobrador on 24/7 basis as oppose to only 8 hours daily
  - Improved standard of living (e.g. use of appliances for women's daily chores) and better education tools for children (e.g. use of computers, internet, etc.)
  - enhanced livelihood and income generating opportunities (i;.e., refrigeration, marble processing, etc.)
  - ROMELCO can operate the plant without subsidizing the costs of power; costs can be offset by subsides through UCME
  - Lower HH tariff for electricity from Php30.00 (USD0.67)/kWh to Php11.38 (USD0.25); increase purchasing power for other basic necessities
  - Capacity-building for ROMELCO in operating hybrid system
  - Increased power generation from renewable energy for ROMELCO
  - 24,000 liters of diesel will be saved every year which would cost around USD500,000 for the project duration
  - Will lead to some 1,297 tons in CO<sub>2</sub> reduction



### WAY FORWARD

Feasibility Study for the identification of the least cost option

Support financial and institutional arrangements

#### **Pilot testing**

#### Monitoring and Evaluation



# Thank you for your attention!