



Rural Electrification

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JICA Study Team



Contents

1. **Objective**
2. **Workflow & Organization**
3. **Present Situation of Barangay Electrification**
4. **Proposed Plan of Barangay Electrification**
5. **Selection Method**
6. **Database**
7. **Summary**

Collaboration Work on Preparing Rural Electrification (R/E) Plan

**DOE : Main
R/E Plan Preparation**

NPC-SPUG

NEA

JICA Team

Discuss Concept & Step for R/E Plan

Draw Work Flow for R/E Plan

Prepare Map for Project Monitoring etc

Basic Concept of R/E Promotion (On / Off Grid)

Significance of Electrification ➤ Rural Development



Construction of Grid Network ➤ Social Infrastructure



Issues

Huge Investment
Long Time

Low Demand in Rural Area



Not Feasible








Advice

Efficient Combination of Grid
Extension and Stand-Alone System

Objective and Situation of Rural Electrification Plan



-  **Total Electrification of the Philippine**
-  **Promote Private Investment in Missionary Electrification**
-  **Commercialize / privatize existing SPUG areas**
-  **Institutional Relationship**
-  **Regulatory Aspects**

Share of MEDP & DDP

Un-Energized Barangay
Total : 5,409
ECs : 5,277
PIOU/LGU : 132

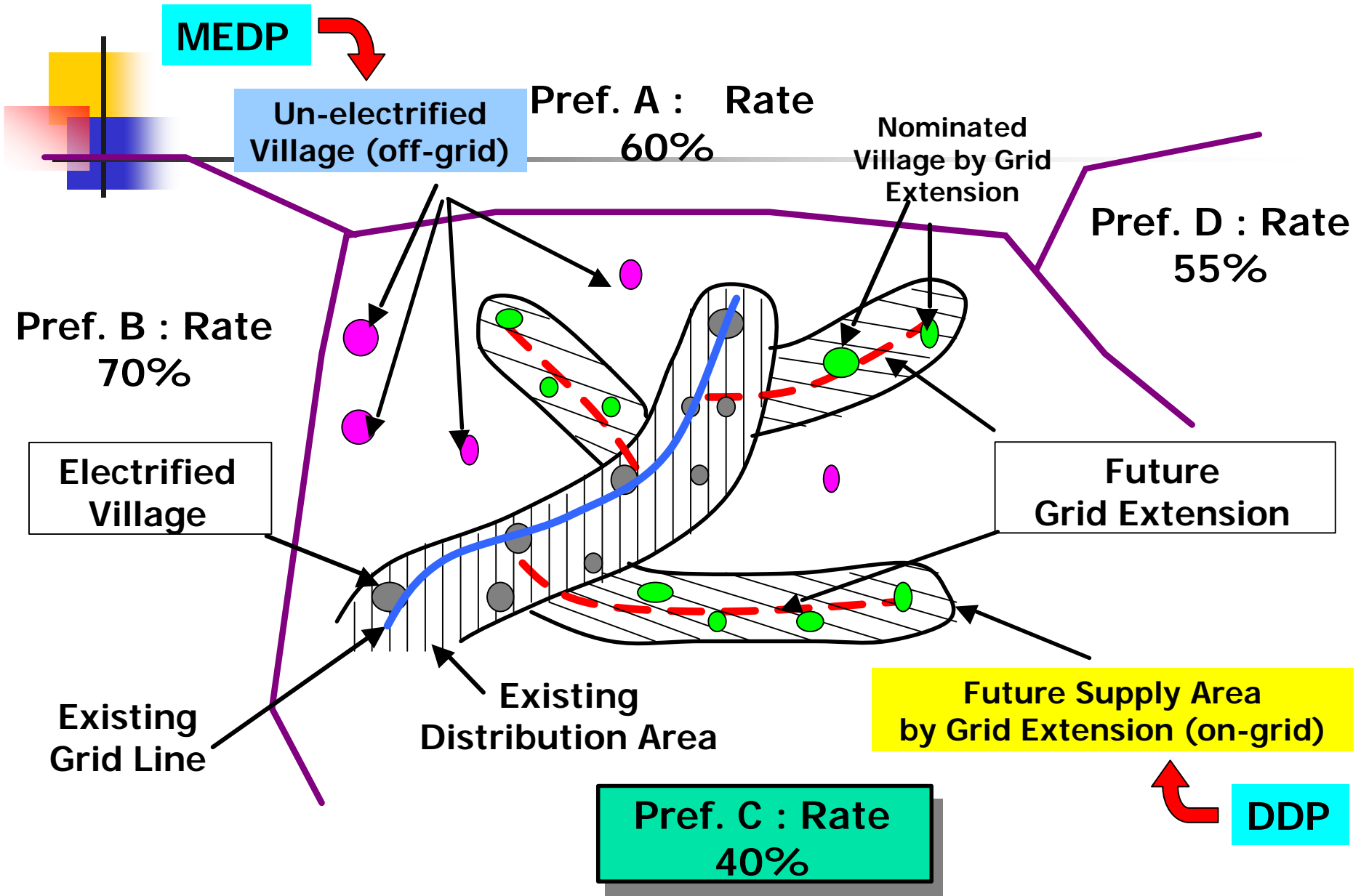
For Stand-Alone

For Grid Extension

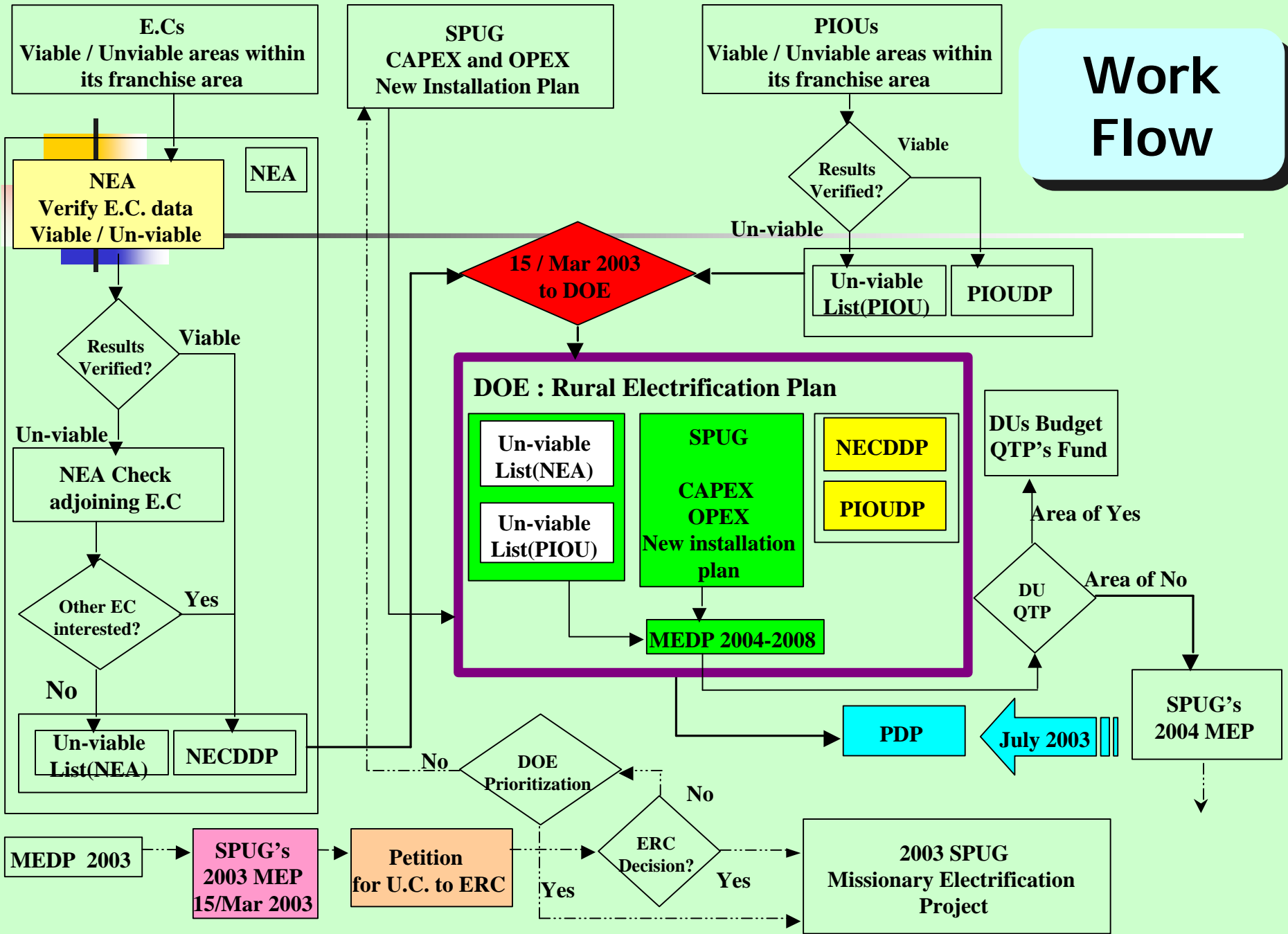
MEDP

DDP

Image of Cover Area of DDP & MEDP

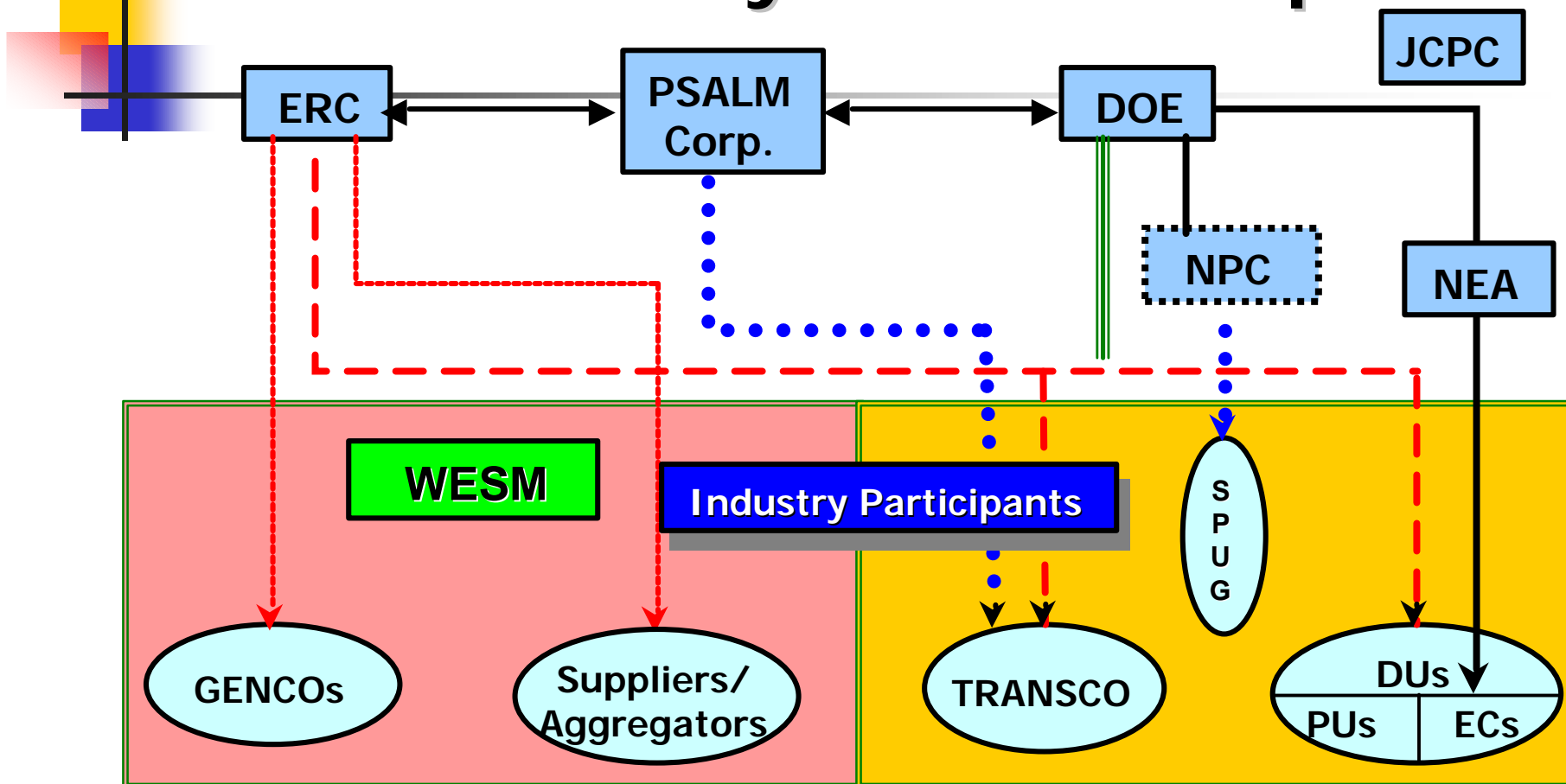


Work Flow





New Industry Relationships

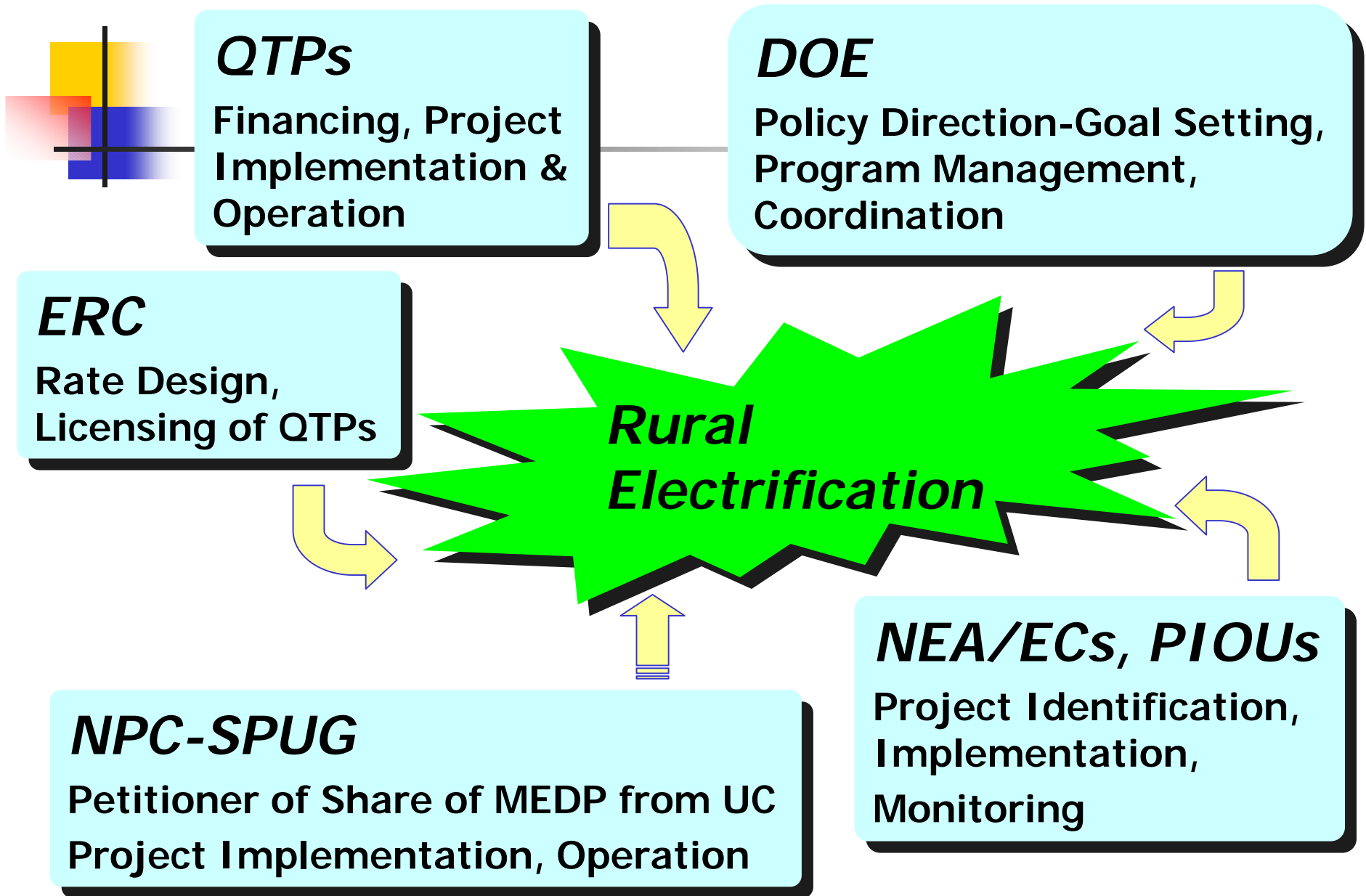


LEGEND:



Source : DOE Presentation

Rural Electrification Family



Historical Performance of Rural Electrification (1999 - 2002)

Number of Energized Barangay

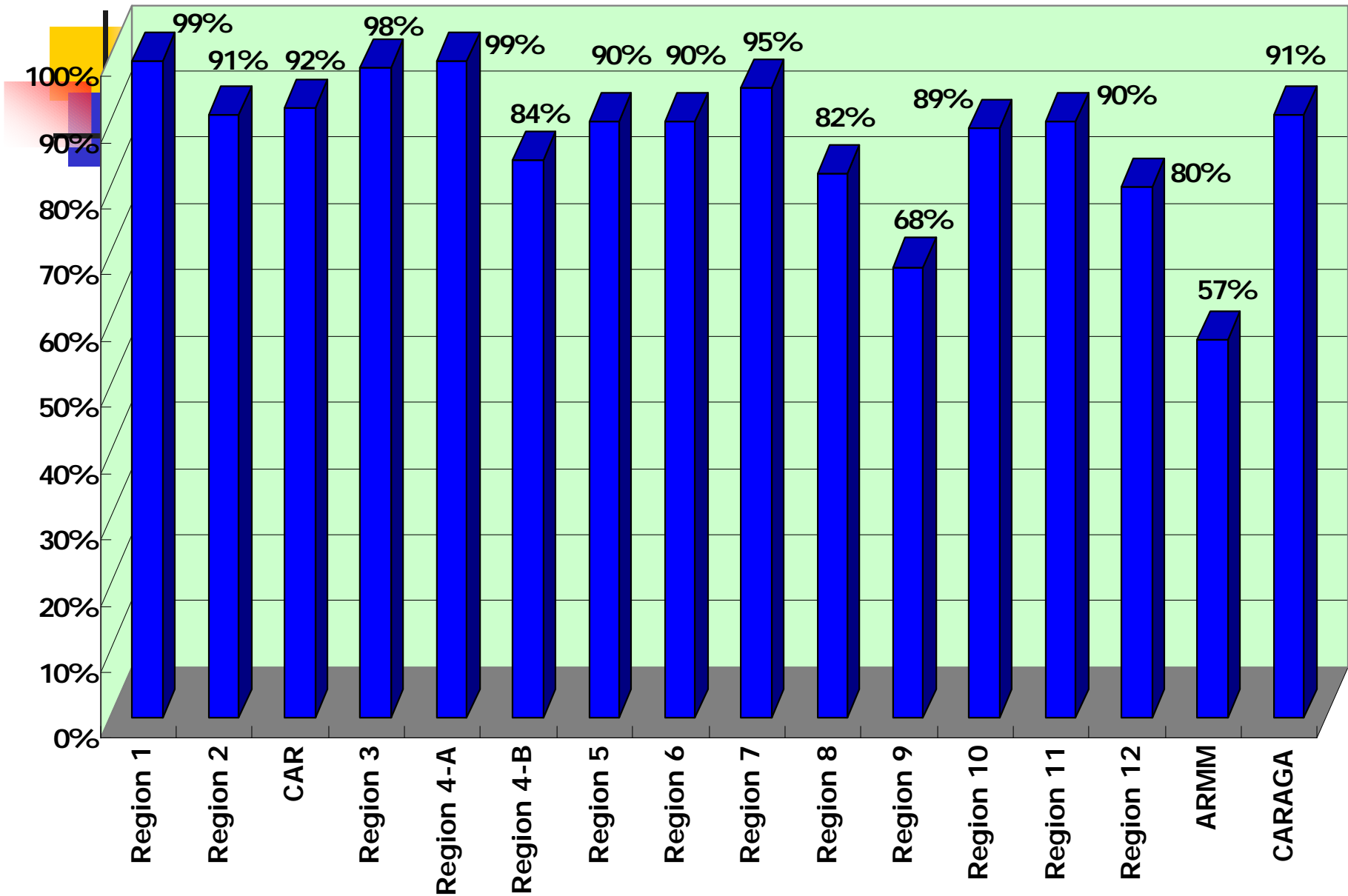
Year	Target Number	Actual Number	Cumulative Number	Remaining Number	Rate (%)
1999	900	755	32,281	9,731	76.9
2000	1,621	1,36	33,647	8,352	80.1
2001	1,353	1,244	34,891	7,108	83.1
2002	1,636	1,699	36,590	5,409	87.1

Source : O-I Law Terminal Report

Source : DOE

ECs Electrification Level by Regions

As of Jun 2003



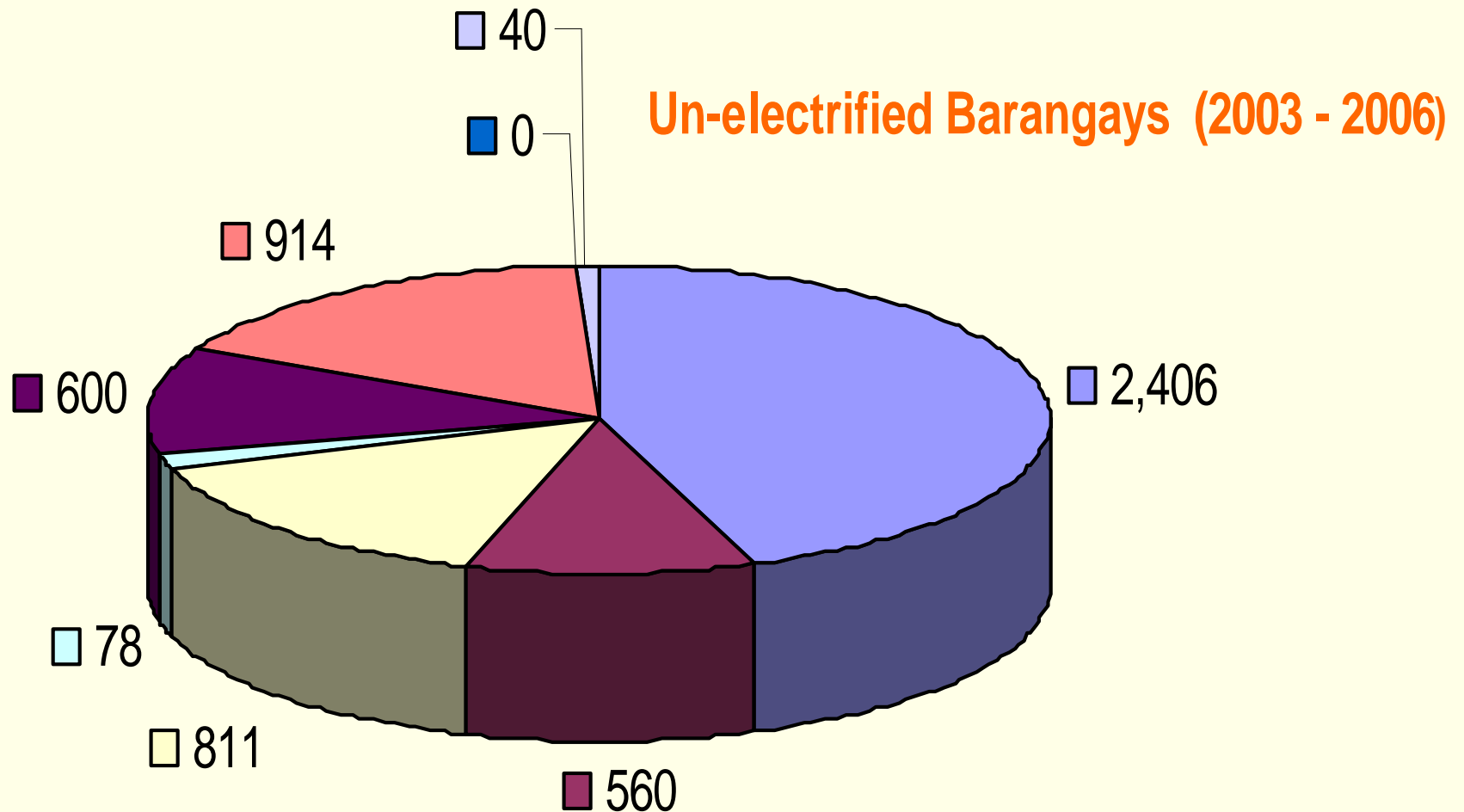
Proposed Number of Rural Electrification

Total Number of Un-Energized Barangay : 5,409

Year	Target Number	Remaining Number	Cumulative Number	Rate (%)
2003	1,619	3,790	38,209	91
2004	1,258	2,532	39,467	94
2005	1,304	1,228	40,771	97
2006	1,228	0	41,999	100

As of Jun 2003

Rural Electrification Promotion by Organization



■ NEA
 ■ NPC-SPUG
 ■ DOE
 ■ PIOUS/LGUS
 ■ PNOC-EDC
 ■ IPPs
 ■ Adopt a Barangay
 ■ Others

Appraisal of Universal Charge

NPC-SPUG Proposed CY 2002

Total Levy (P/kWh)	0.0831
Operating Cost (OPEX)	0.0256
Capital Expense (CAPEX)	0.0575

140
Barangay

ERC Approval CY 2002

0.0168
0.0168
0

Final UC CY 2003

0.0373
0.0143
0.0230

44
Barangay

CAPEX JUL-DEC 2003



Present Fund Source

- **ER1-94 (PHP 0.01/kWh) by GENCOs**
- **Barangay Electrification Program (BEP)**
- **NEA Subsidy to ECs**
- **UC for NPC-SPUG / QTPs**
- **PNOOC Fund (Geothermal Service Contract)**
- **Other Donors (ODA, Loan etc)**

Organization to promote

**O-I LAW
Project Team**



Expanded Rural Electrification (ER) Team

**Oversight
Committee**

DOE
NEA
NPC-SPUG
PNOC-EDC
PNOC
NEDA
DOF



**Technical
Working Group**

NEA
DOE
NPC-SPUG
PNOC



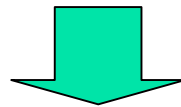
Example of Selection Procedure

Grid Extension vs PV System

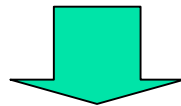
20 Years Total Cost
Initial Investment
O & M Cost

etc

20 Years Total Power
Generated (kWh)



Generation Cost (PHP/kWh)



Lower Cost System is considered

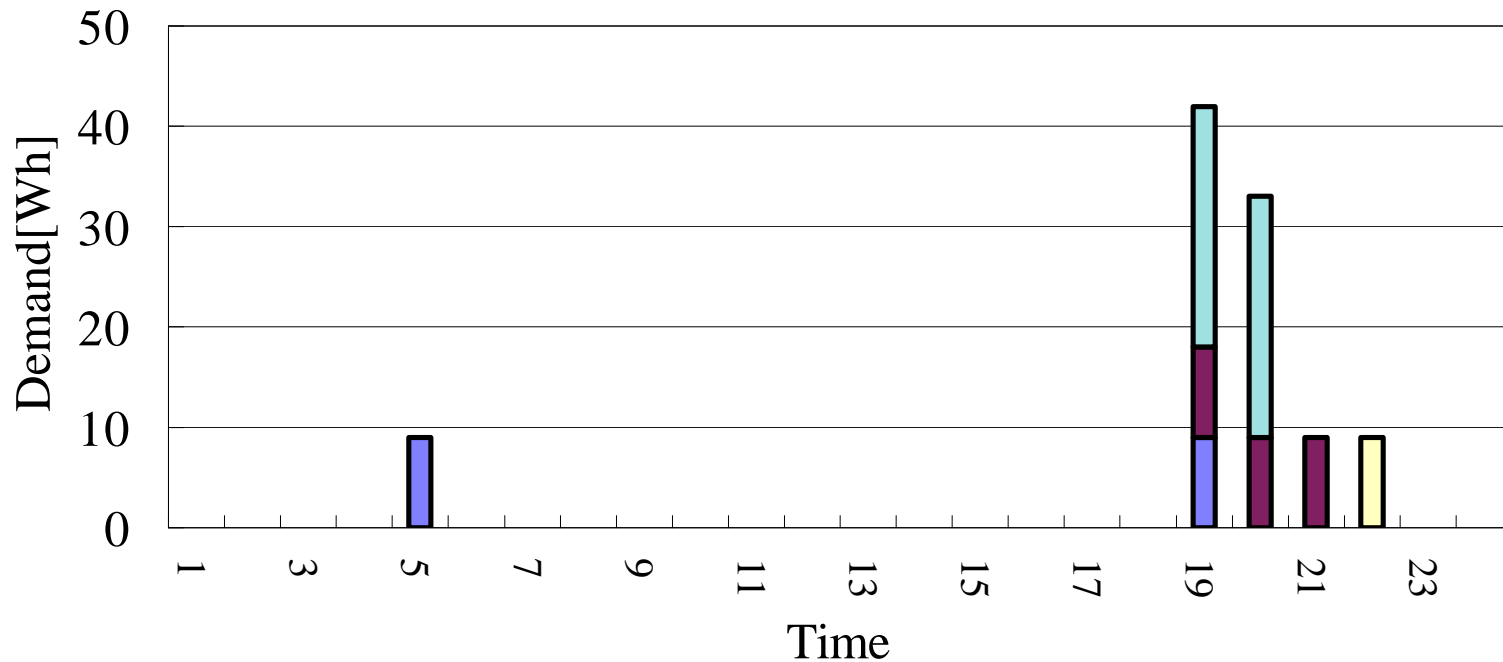
9W Fluorescent lamp x 2hrs x 3Lamps = 54Wh

(AM6:00~7:00 x 1Lamp,

PM7:00~8:00 x 2Lamps, PM8:00~10:00 x 1Lamp)

24W TV 2hrs = 48Wh

Total Power Demand: 102Wh

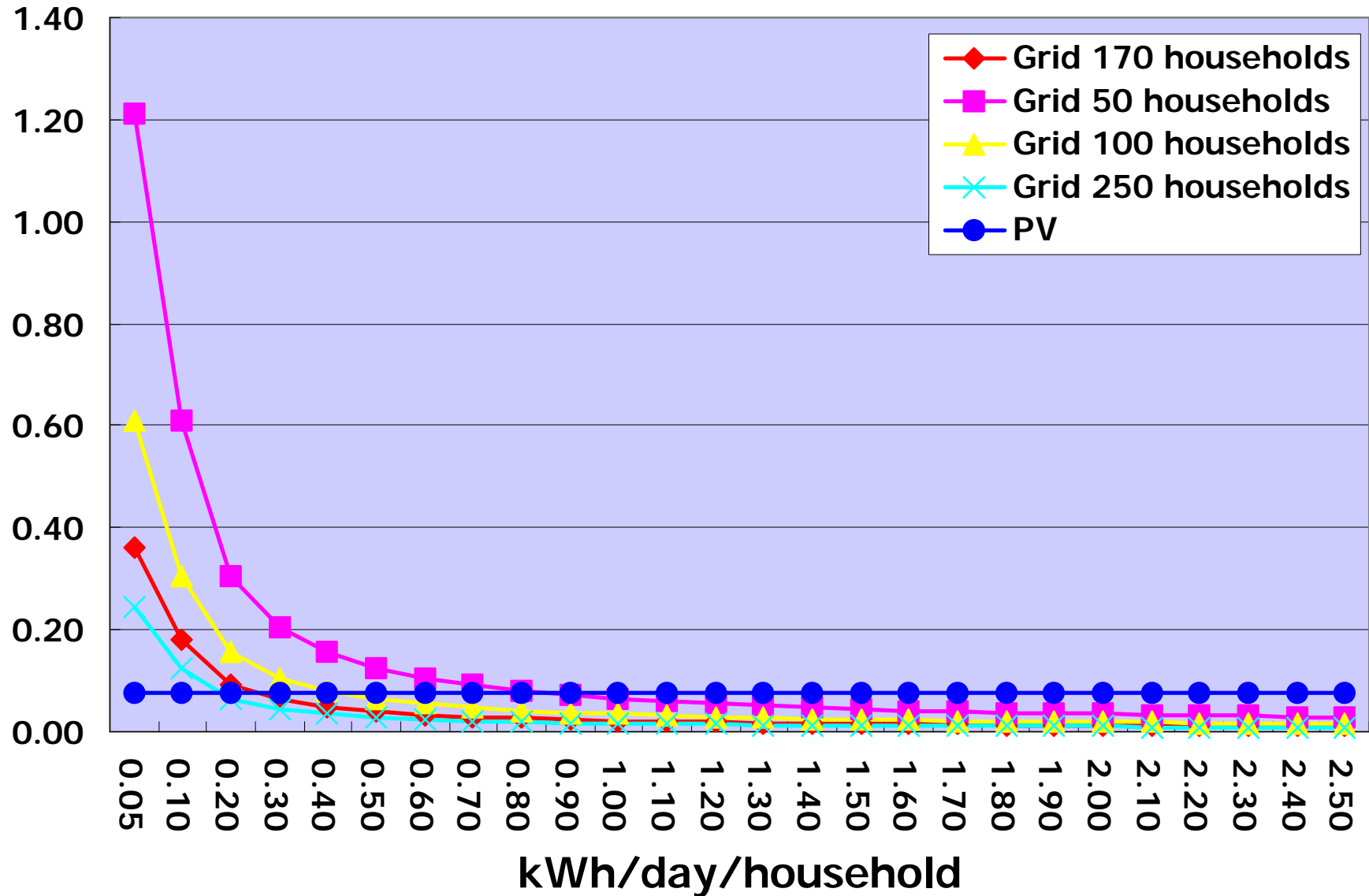


■ Lamp1•9W•j ■ Lamp2•9W•j ■ Lamp3•9W•j ■ TV•24W•j

25km from Grid Line

Grid Extension VS PV(Aurora)

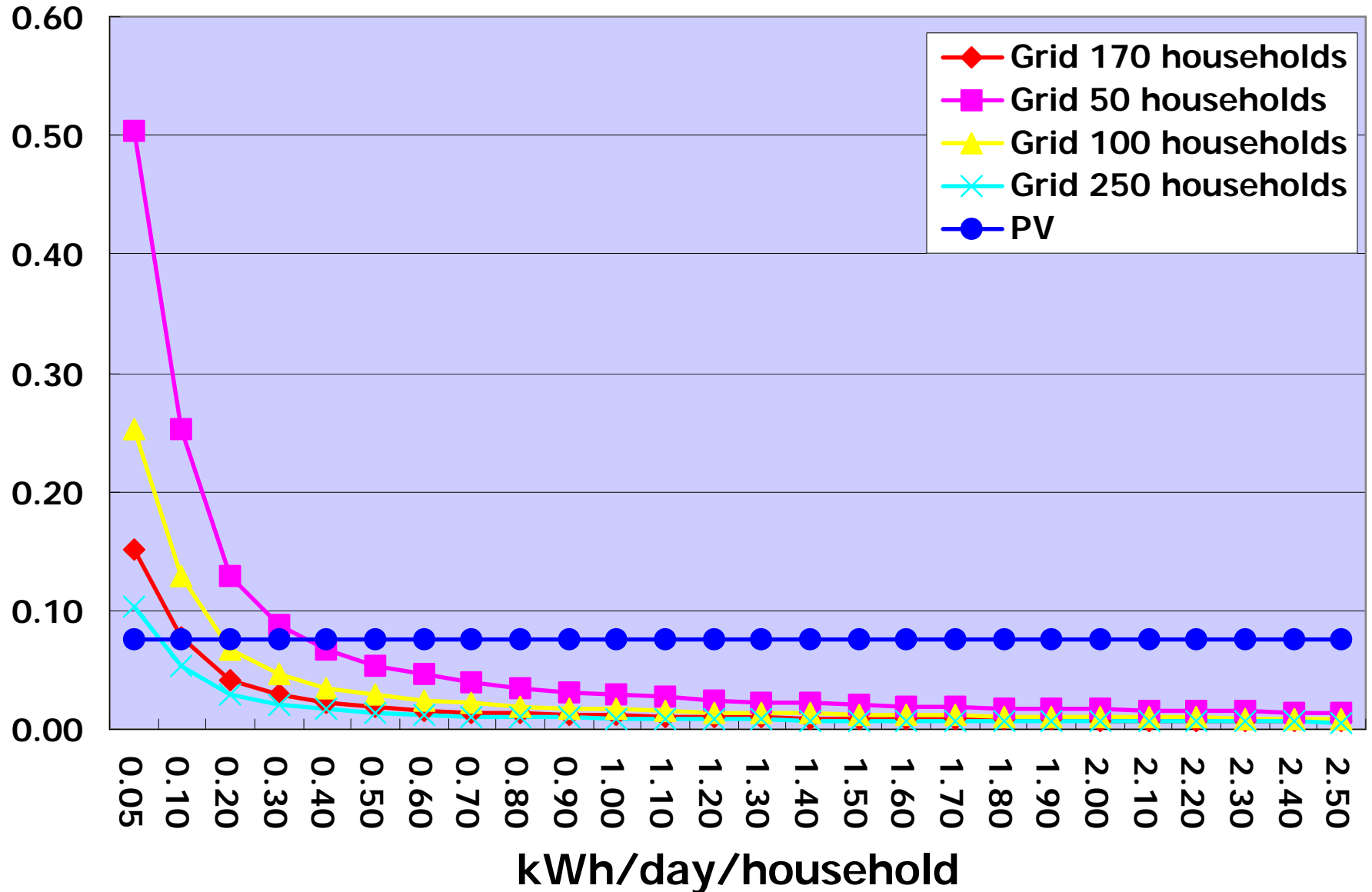
P1000/kWh



10km from Grid Line

Grid Extension VS PV(Aurora)

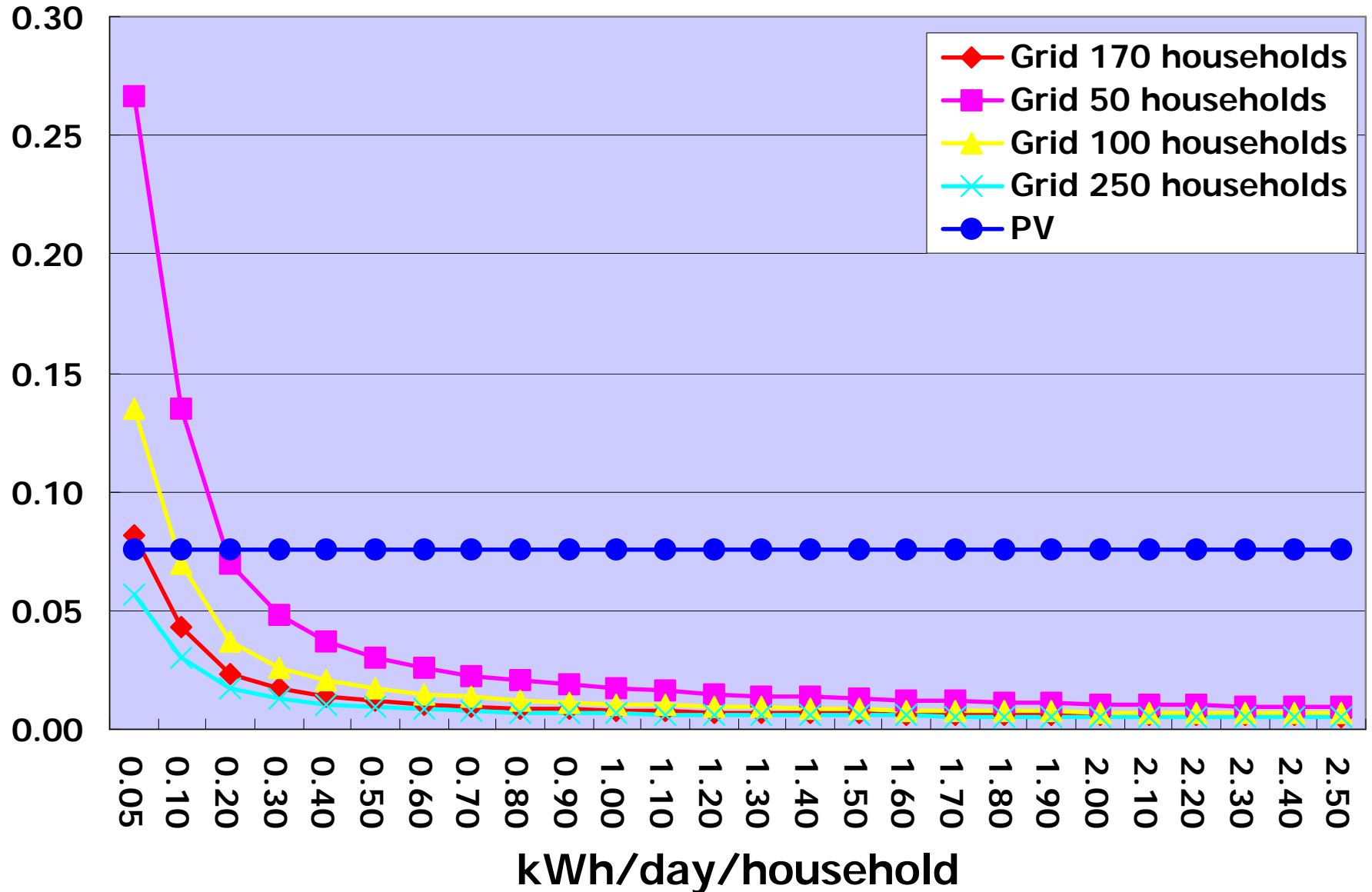
P1000/kWh



5km from Grid Line

Grid Extension VS PV(Aurora)

P1000/kWh



0.5km from Grid Line

Grid Extension VS PV(Santiago)

P1000/kWh

0.08

0.07

0.06

0.05

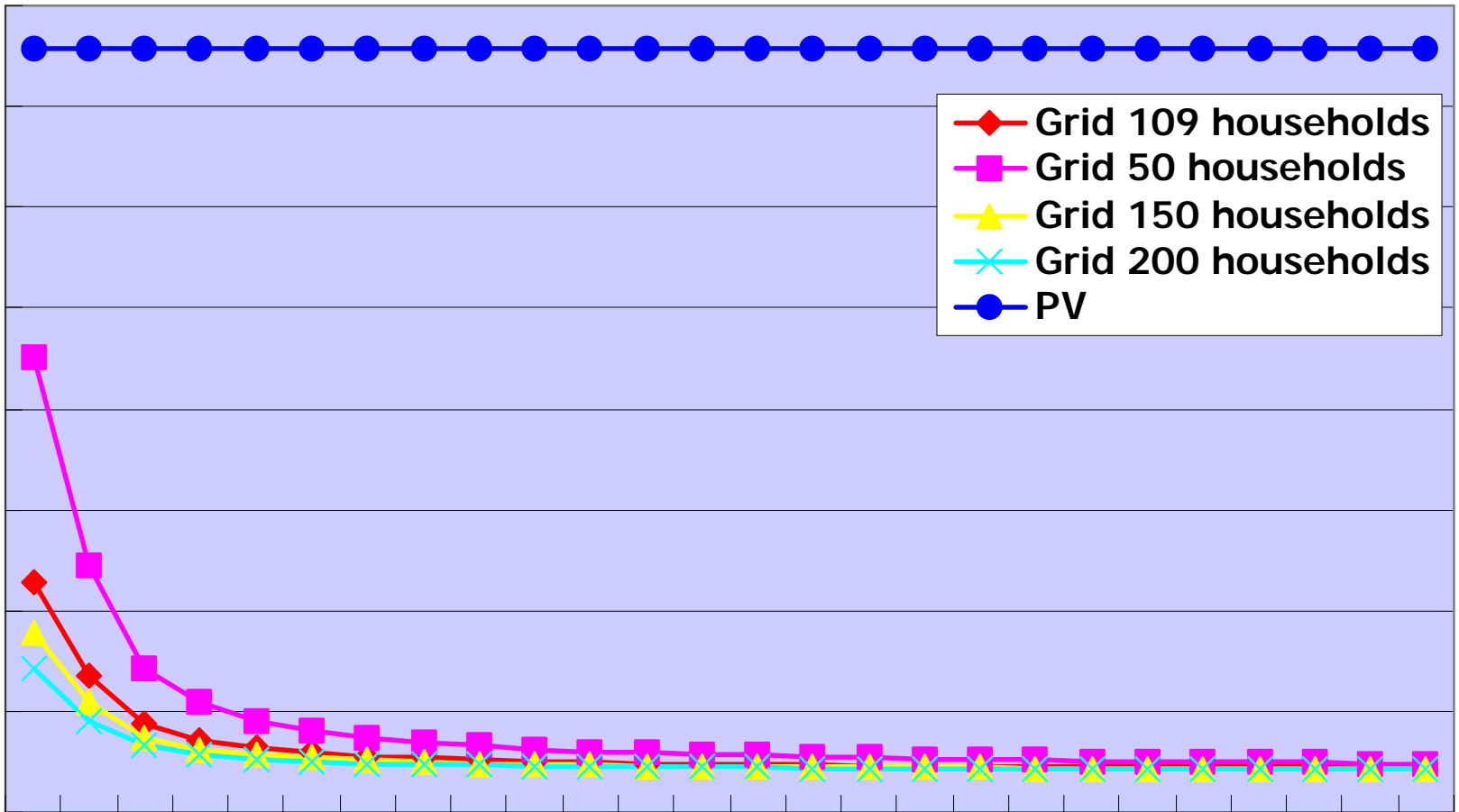
0.04

0.03

0.02

0.01

0.00



0.05 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 2.10 2.20 2.30 2.40 2.50

kWh/day/household

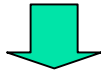
<Result (example)>

Household : 170

Distance from Grid : 25km

Load > 0.3kWh/Day.HH : Grid Extension

Load < 0.3kWh/Day.HH : PV system



Distance from Grid : 10km

Load > 0.1kWh/Day.HH : Grid Extension

Load < 0.1kWh/Day.HH : PV system



Distance from Grid : 5km

Load > 0.07kWh/Day.HH : Grid

Extension Load < 0.07kWh/Day.HH : PV system



Distance from Grid : 0.5km

Grid Extension is cost feasible.

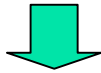
<Result (example)>

Household : 50

Distance from Grid : 25km

Load > 0.8kWh/Day.HH : Grid Extension

Load < 0.8kWh/Day.HH : PV system



Distance from Grid : 10km

Load > 0.4kWh/Day.HH : Grid Extension

Load < 0.4kWh/Day.HH : PV system



Distance from Grid : 5km

Load > 0.2kWh/Day.HH : Grid Extension

Load < 0.2kWh/Day.HH : PV system

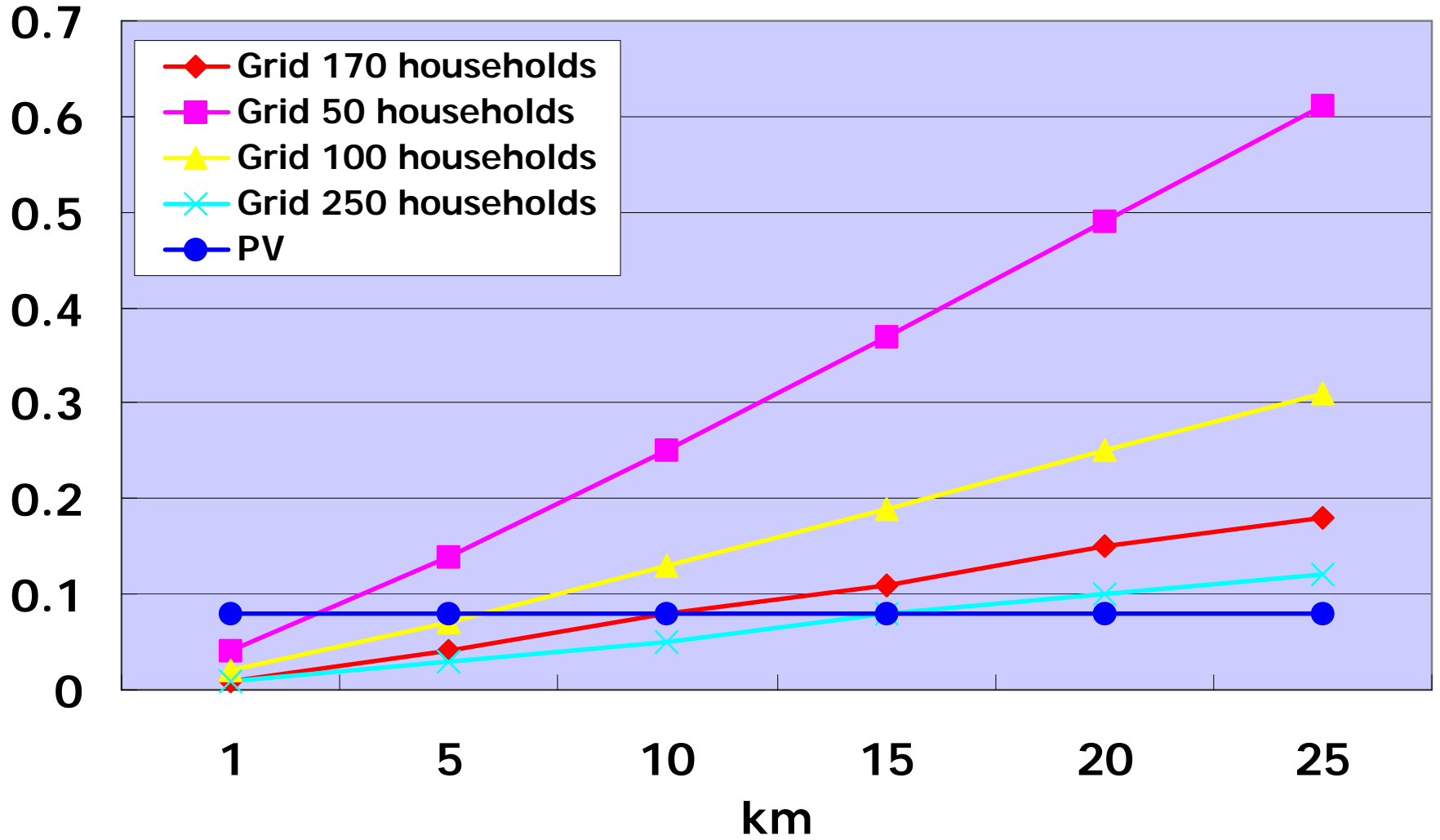


Distance from Grid : 0.5km

Grid Extension is cost feasible.

Length of Grid Extension VS PV(Aurora) (Demand :0.1kWh/day)

P1000/kWh



<Result (example)>

Assumption of Consumption : 0.1kWh/Day.HH

Household : 250

Distance > 15km : PV system

Distance < 15km : Grid

Extension ↓

Household : 170

Distance > 10km : PV system

Distance < 10km : Grid

Extension ↓

Household : 100

Distance > 5km : PV system

Distance < 5km : Grid Extension



Distance < 3km

Grid Extension is cost feasible



Factors for Consideration

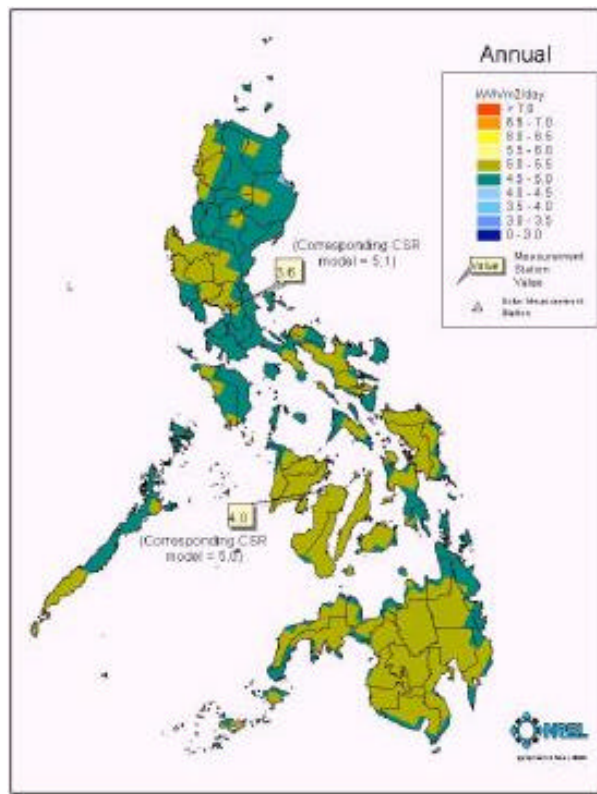
Distance is far from grid line and demand is small, stand-alone system like PV system has advantages.

General assumption is used for this examples. Actual assumption (Location, Distance, Access etc) is needed to adopt for specified Barangay.

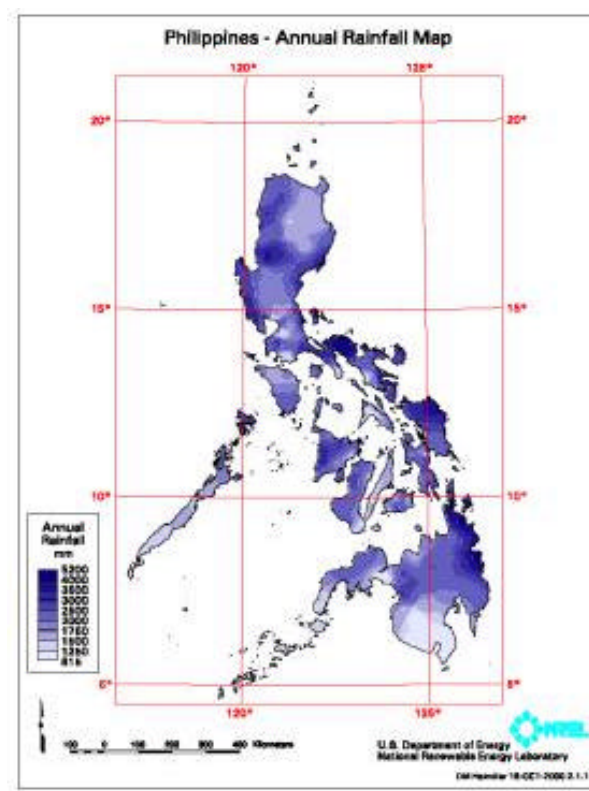
Typical sample is available by changing assumptions.

Potential of Renewable Energy

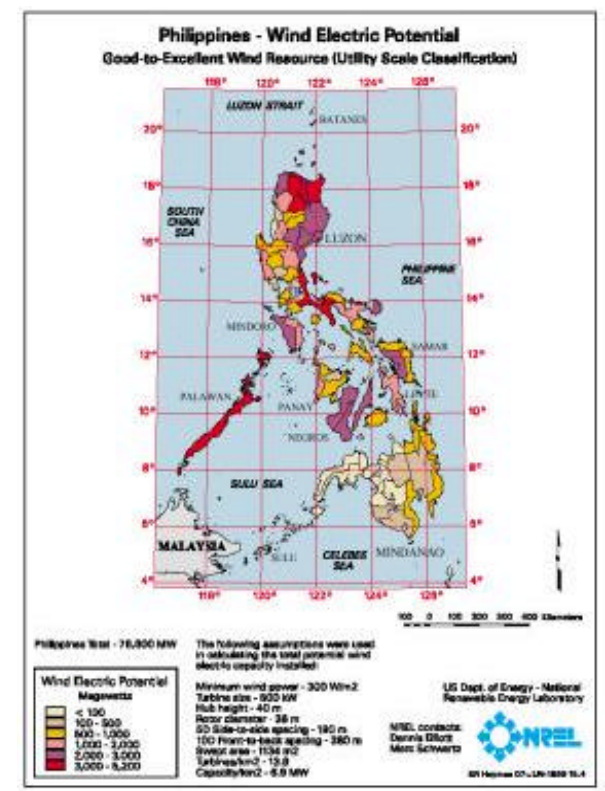
Insolation



Precipitation



Wind Power





Utilization of Renewable Energy Resource

Insolation

4.5 to 5.5 kWh/m²
Yearly Average in Philippine



Far from Grid Line &
Insolation High



PV system is useful

Rainfall

Far from Grid Line
Geographical Condition



Micro-Hydro system
is useful

Wind Power

Energy Potential is High



Wind system is
useful

Database for DOE

Electrification Ratio Map

Objective

For Smooth Project Monitoring
For Future Plan

Easily &
Visually

1st Stage

Municipality Level &
Each ECs Level Data

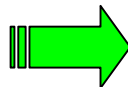


Each Regions &
ECs Completed



2nd Stage

Barangay Level



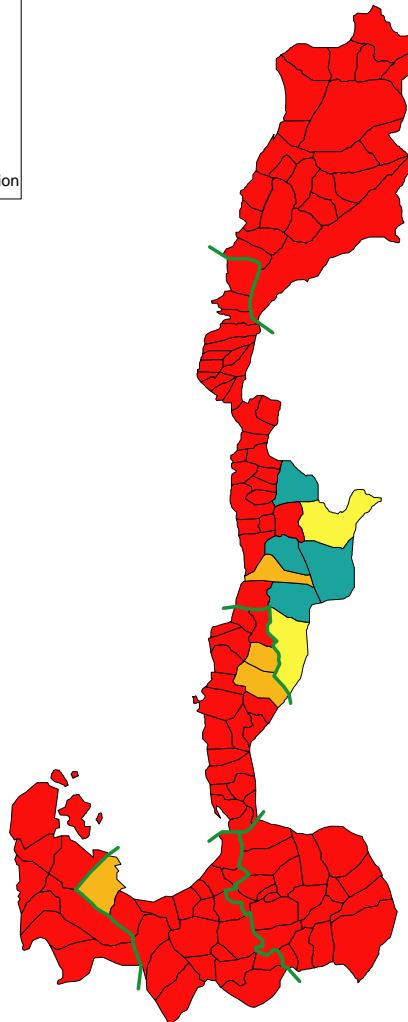
JICA Team
Sample
(Masbate)



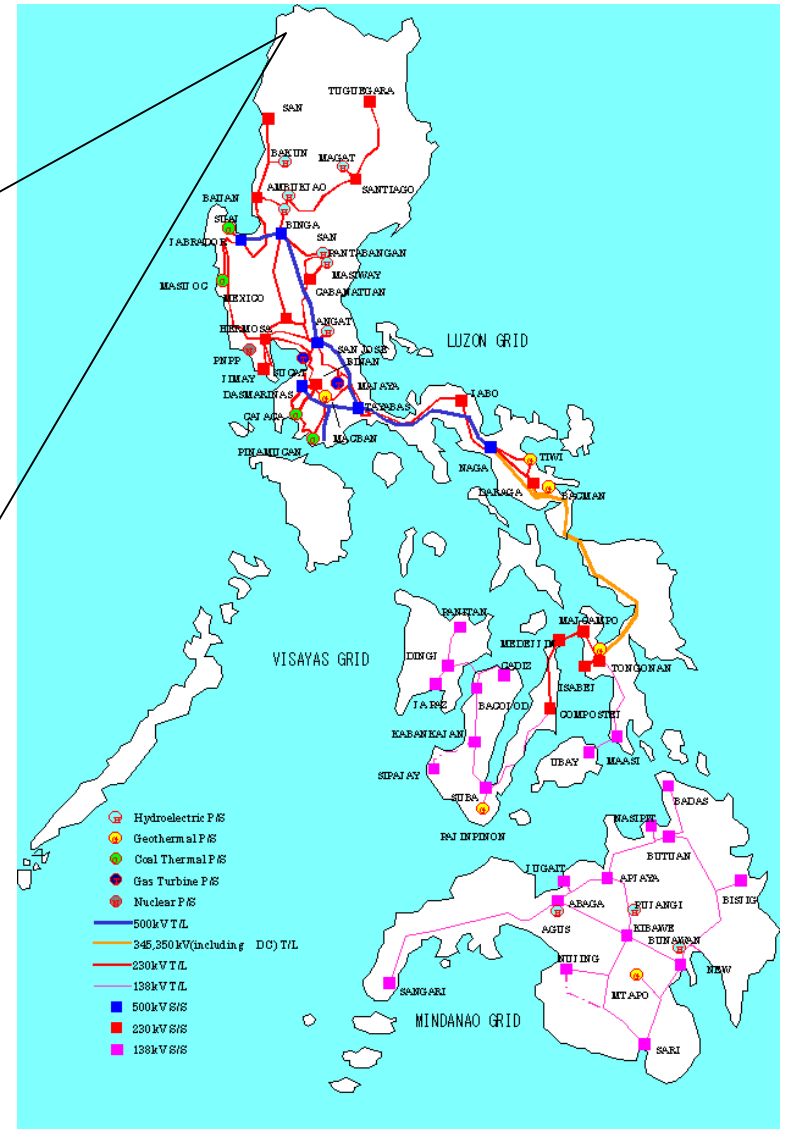
DOE will
follow!!

MAP OF ELECTRIFICATION RATIO

- Legend**
- 90% and above
 - 89% to 75%
 - 74% to 50%
 - Under 49%
 - Data unavailable
 - Municipality Border
 - Electric Utilities Jurisdiction

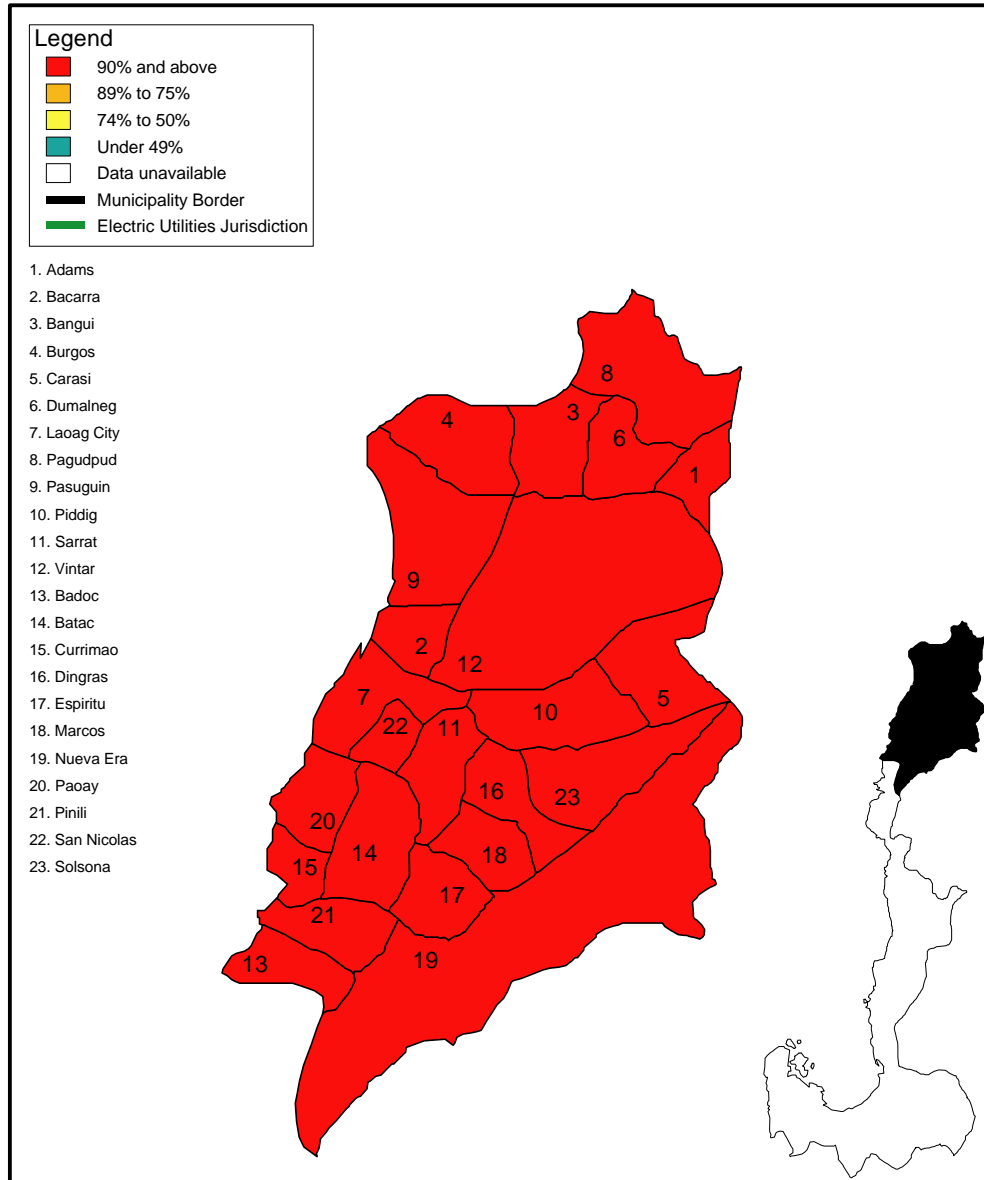


REGION 1



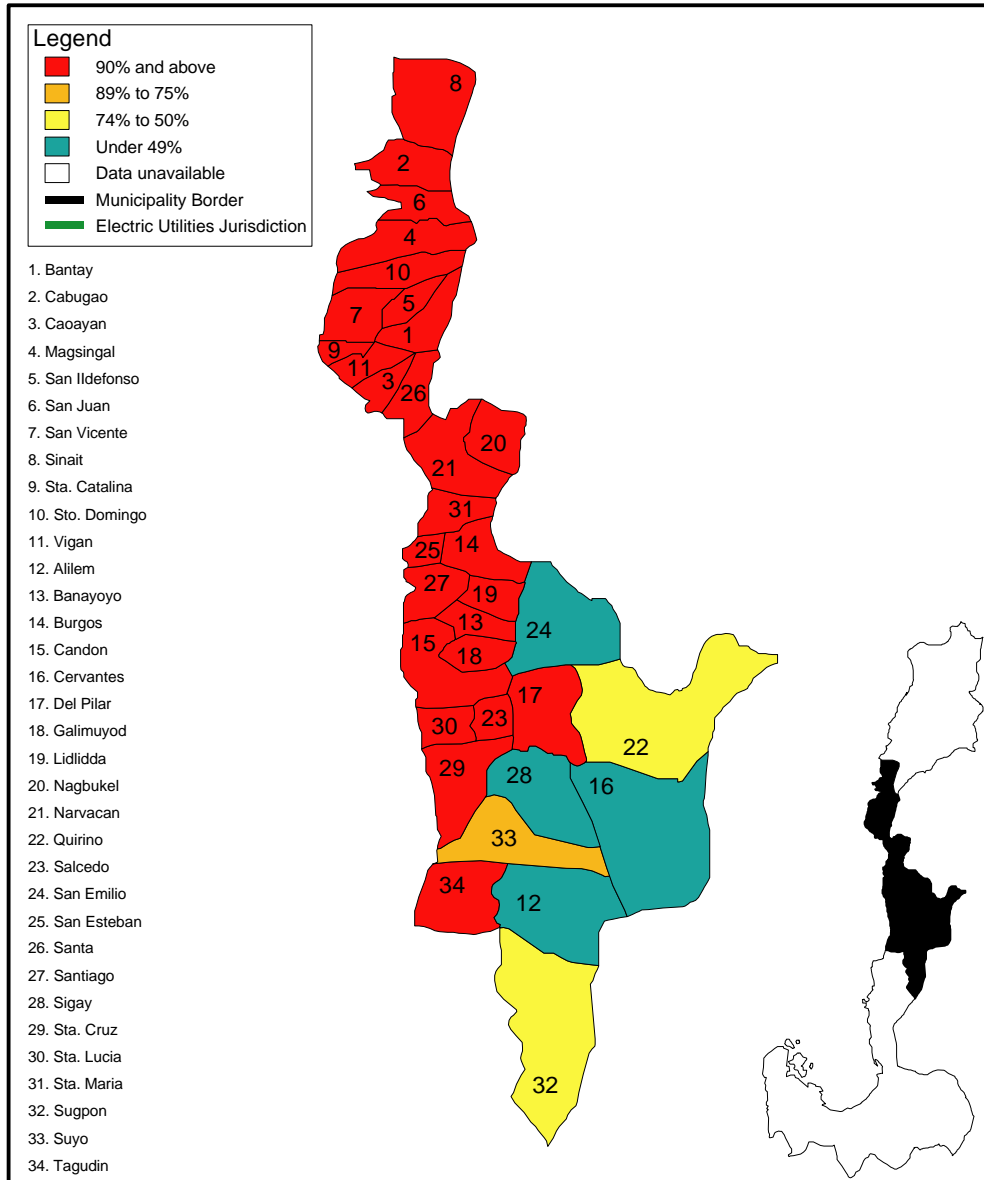
Example Map

MAP OF ELECTRIFICATION RATIO



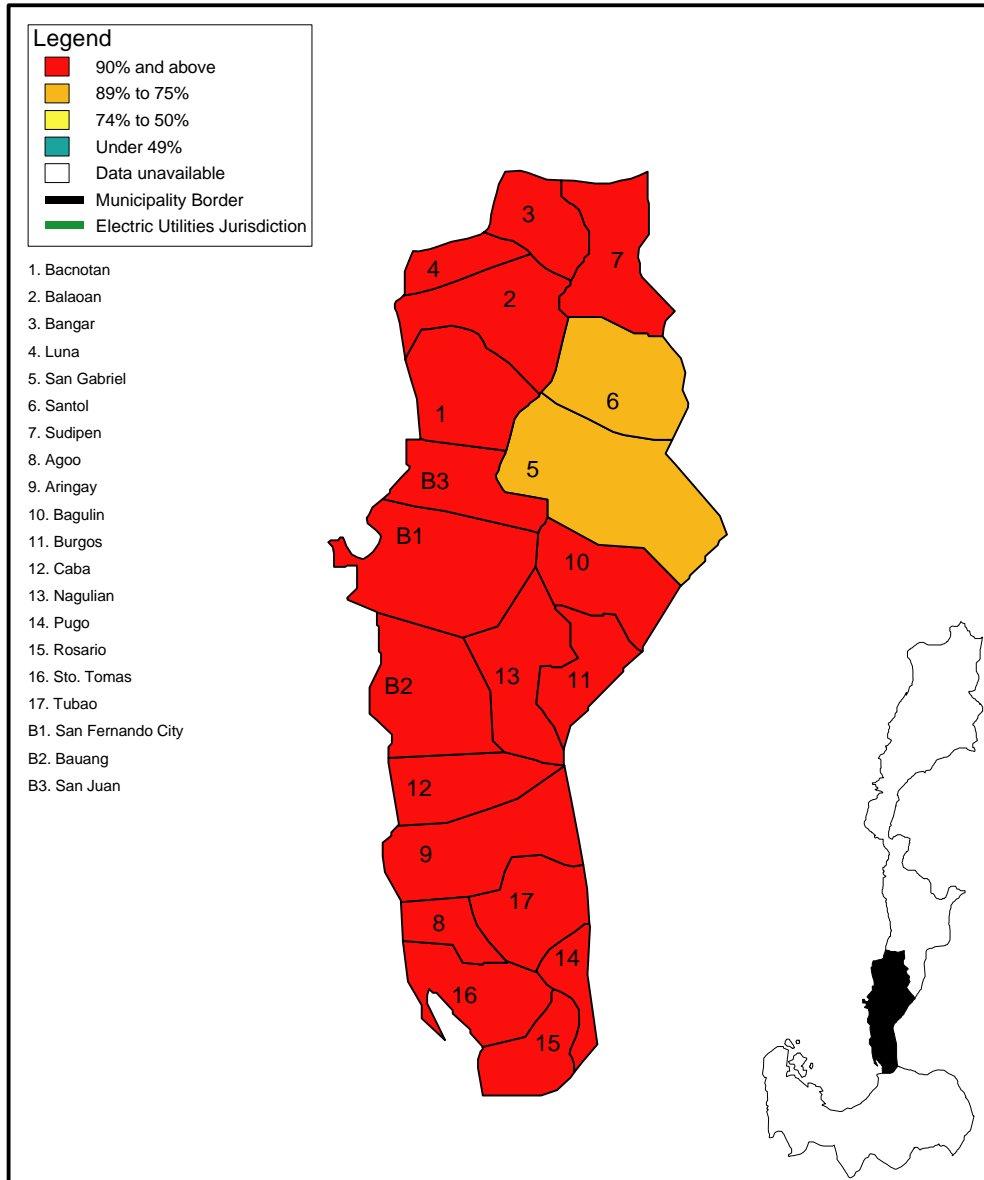
REGION 1-1 Illocos Norte

MAP OF ELECTRIFICATION RATIO



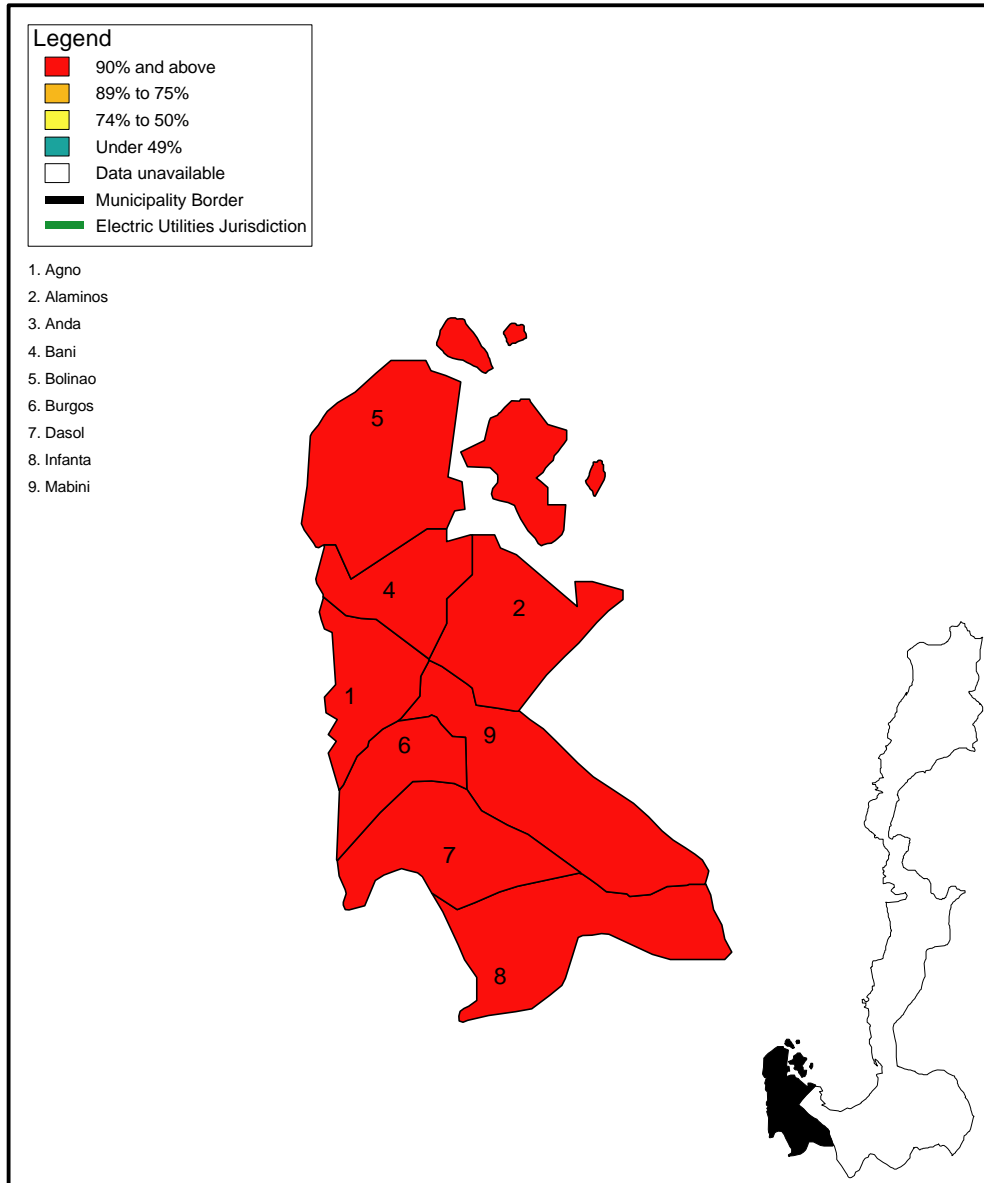
REGION 1-2 Illocos Sur

MAP OF ELECTRIFICATION RATIO



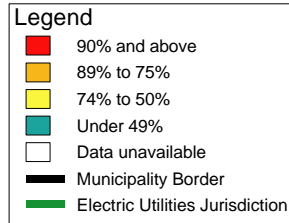
REGION 1-3 La Union

MAP OF ELECTRIFICATION RATIO

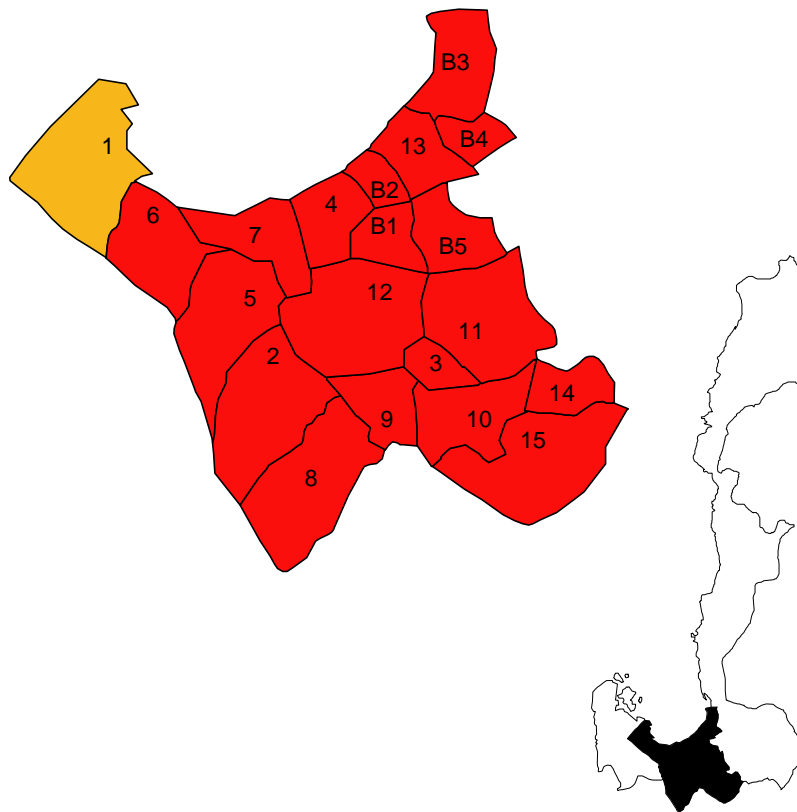


REGION 1-4 Pangasinan 1

MAP OF ELECTRIFICATION RATIO

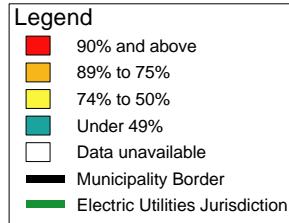


1. Sual
2. Aguilar
3. Basista
4. Binmaley
5. Bugallon
6. Labrador
7. Lingayen
8. Mangatarem
9. Urbiztondo
10. Bayambang
11. Malasiqui
12. San Carlos City
13. Mangaldan
14. Alcala
15. Bautista
- B1. Calasiao
- B2. Dangupan City
- B3. San Fabian
- B4. San Jacinto
- B5. Sta. Barbara

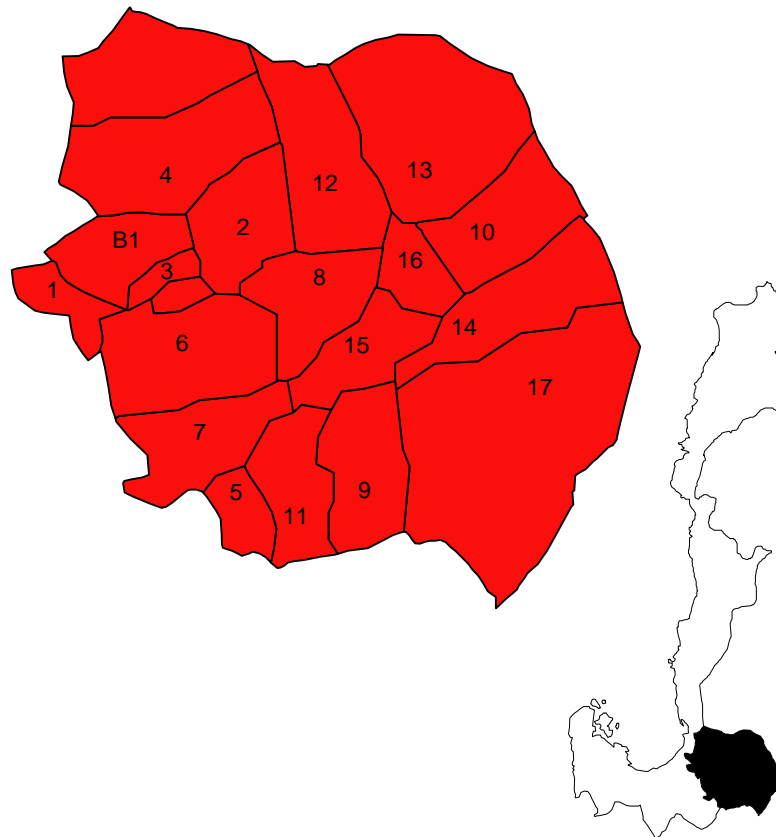


REGION 1-5 Central Pangasinan

MAP OF ELECTRIFICATION RATIO



- 1. Mapandan
- 2. Binalonan
- 3. Laoac
- 4. Pozorrubio
- 5. Sto. Tomas
- 6. Urdaneta City
- 7. Villasis
- 8. Asingan
- 9. Balungao
- 10. Natividad
- 11. Rosales
- 12. San Manuel
- 13. San Nicolas
- 14. San Quintin
- 15. Sta. Maria
- 16. Tayug
- 17. Umingan
- B1. Manaoag

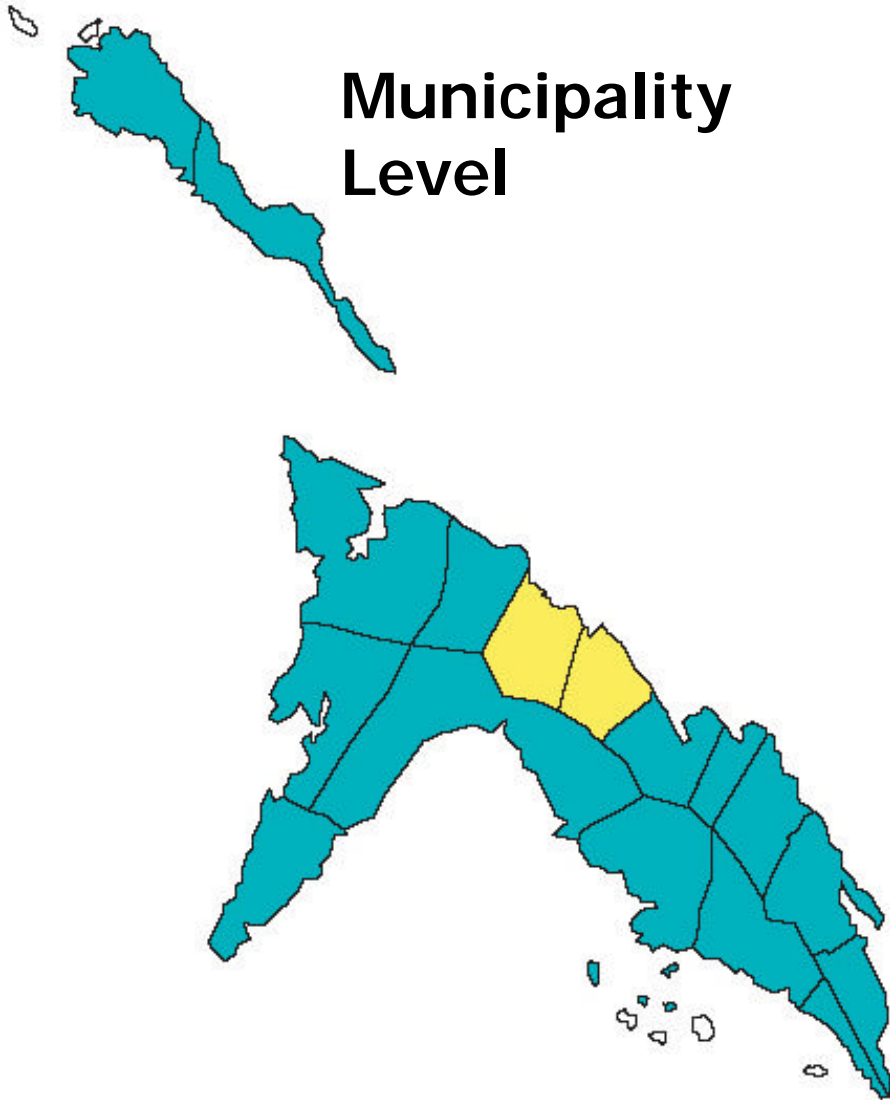


REGION 1-6 Pangasinan 3

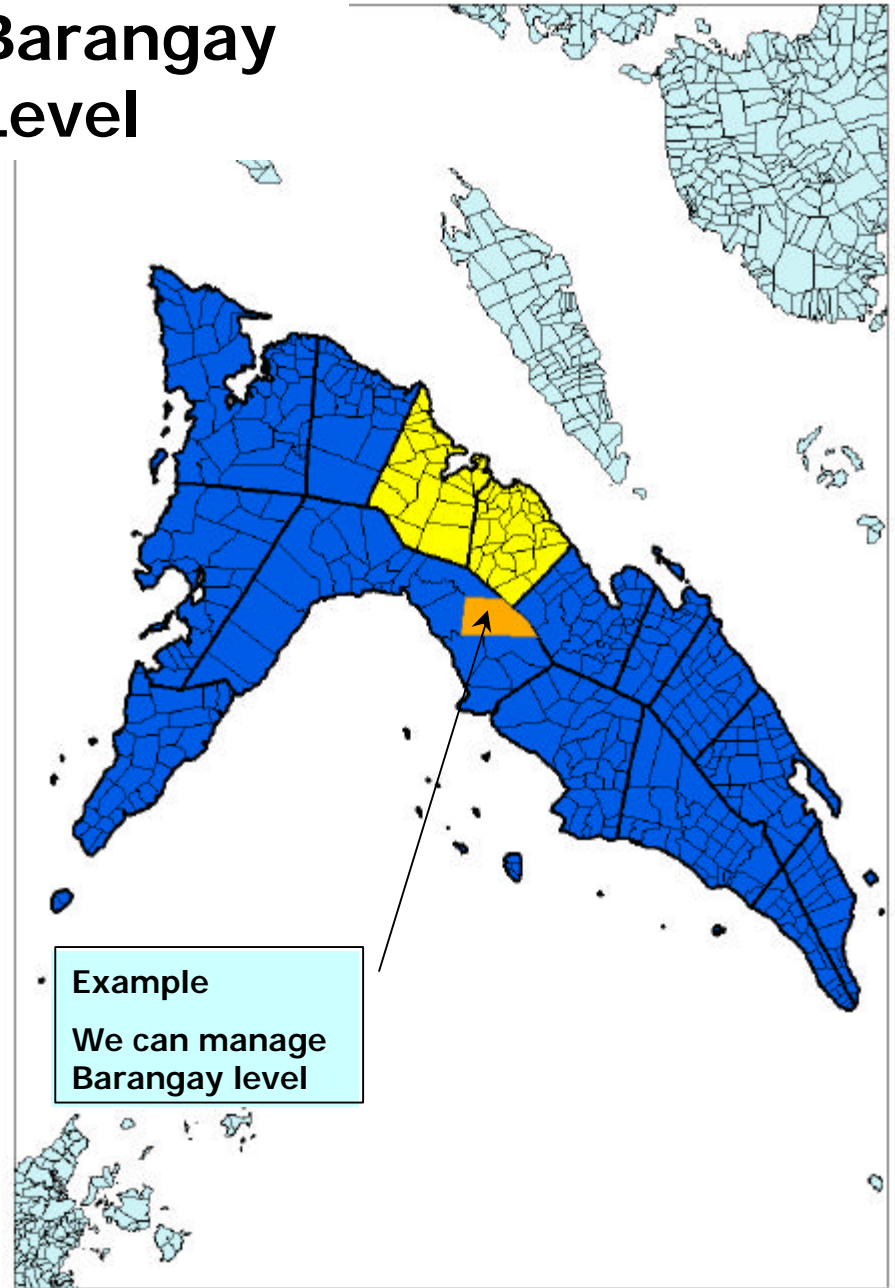
Masbate Island



Municipality Level

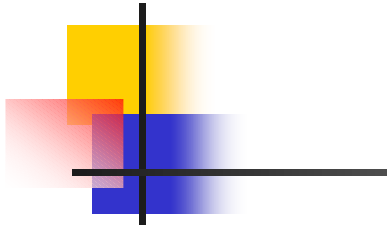


Barangay Level



Location: (123.630257 12.188534)

Field	Value
FID	24966
Shape	Polygon
ID_	4112023
NAMEMR2000	San Carlos
NAMEJN2002	San Carlos
GEOCODE	054112023
PRTTOWNCTY	1
STRPATTERN	1
ACCESSHWAY	2
CITYHALL	2
CHURCHMOSQ	1
PLAZA	2
CEMETERY	1
MARKET	2
ELEMSCHOOL	1
HIGHSCHOOL	2
COLLUNIV	2
PUBLICLIB	2
HOSPITAL	1
HEALTHCTR	1
BGYHALL	2
HSGPROJ	2
NEWSPAPER	2
TELEPHONE	2
TELEGRAPH	2
POSTAL	2
WATERSYS	2
ELECTRICIT	2
WSTWTERDSP	3
BGSTORES	5
BGMFESTAB	0
BGRPRSHOP	0
BGRESTRANT	0
BGHOTELDRM	0
BGRECREATN	0
BGBANK	0





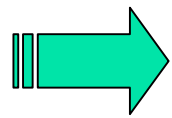
Advantages of Mapping

By utilizing this map, the following issues are found visually:

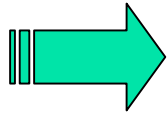
- Lower electrification rate Municipality is given priority for electrification.
- Un-energized Barangay which is far from the grid line is given priority for introducing stand-alone systems.



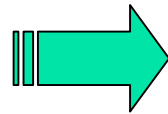
Advice for Future Promotion



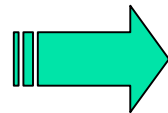
**Rural Electrification Framework
Completion**



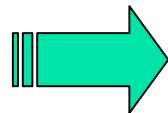
Building Database



Strengthen Organizations



Obtain Funding



Regulatory Framework

Summary

1. **Work Flow**

Work flow was drawn by cooperation of R/E families. This work flow will utilize for future planning.

2. **Rural Electrification Program**

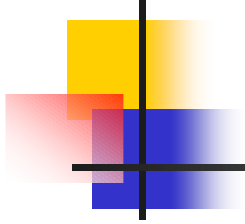
DOE and Team discuss 5 years rural electrification planning concept. Examples of electrification selection procedure is indicated. The output of other activity and this study is taking into account, DOE start to prepare MEDP.

3. **Present Situation of Rural Electrification**

Information were collected and analyzed. Based on those information, electrification ratio map were made for DOE's database.

4. **Selection Method of Electrification**

Rough calculation results were indicated. However, for specified Barangay, more practical assumption (Location, HH, Access, Distance, Consumption etc) is required.



THANK YOU !!