Philippine Institute for Development Studies
Surian sa mga Pag-aaral Pangkaunlaran ng Pilipinas

Cost Efficiency and Effectiveness of the *Sitio* and Household Electrification Program

Final Report

Prepared by
Adoracion M. Navarro

for the
Department of Budget and Management

January 2013

Table of Contents

Tables

Figures

Acronyms and abbreviations

ABEP	Accelerated Barangay Electrification Program
AMORE	Alliance for Mindanao Off-grid Renewable Energy
ARMM	Autonomous Region in Muslim Mindanao
ATEO	Accelerated Total Electrification Office
BLEP	Barangay Line Enhancement Program
DBM	Department of Budget and Management
DC	department circular
DDG	Deputy Director-Generals
DEA	data envelopment analysis
DOE	Department of Energy
EC	electric cooperative
EPIRA	Electric Power Industry Reform Act
ER	Expanded Rural Electrification
FGD	focus group discussion
HEP	household electrification program
IPP	independent power producers
kwH	kilowatt-hour
LGU	local government unit
LGUs	local government units
NCR	National Capital Region
NEA	National Electrification Administration
NGO	non-government organization
NPC-SPUG	National Power Corporation-Small Power Utilities Group
NSCB	National Statistical Coordination Board
ODA	official development assistance
PDAF	Priority Development Assistance Fund
PHILRECA	Philippine Rural Electric Cooperatives Association Inc.
Php	Philippine peso
PIDS	Philippine Institute for Development Studies
PNOC	Philippine National Oil Company
PNOC-EDC	PNOC-Energy Development Corporation
QTP	Qualified Third Parties
SEP	Sitio Electrification Program
TEFI	Team Energy Foundation, Inc.
TOR	terms of reference
TWG	technical working group
USAID	United States Agency for International Development
ZBB	zero -based budgeting

Cost Efficiency and Effectiveness of the *Sitio* and Household Electrification Program

Final Report

Adoracion M. Navarro*

Executive Summary

The Department of Budget and Management (DBM) sought the assistance of the Philippine Institute for Development Studies (PIDS) in assessing the cost efficiency and effectiveness of the National Electrification Administration's Sitio Electrification Program (NEA-SEP) and the Department of Energy's Household Electrification Program (DOE-HEP). Based on our assessment of data and information made available to us by the DOE and NEA, as well as data and information we independently researched, we find the following:

- The NEA-SEP had been effective in meeting its target in 2011; the DBM's request for review of the SEP in pre-2011 years is misspecified since the SEP started only in 2011.
- Relative to the DOE-HEP, the average cost per household under the SEP is lower, which proves that on-grid electrification is more cost efficient.
- The DOE-HEP had been less effective in meeting its target in 2011 since it was able to accomplish its one-year target in two years, but this is due to the fact that DOE had not been given HEP budget in 2010 and thereby implementation had been slower.
- The DOE-HEP implementation in 2010-2011 is more cost efficient than the past barangay electrification program implementation and the Alliance for Mindanao Off-grid Renewable Energy (AMORE) program, but this is probably because solar system prices have been declining in recent years and of the fact that AMORE reaches out to conflict-affected areas in Mindanao.
- The "willingness to connect" of households remains an issue despite the presence of subsidies for house-wiring and other initial household electrification expenses.
- Coordination by an overall program team for all the electrification efforts in the country is currently lacking and the previously set up Expanded Rural Electrification Team have some problems, such as follows: (i) responsibilities

* Senior Research Fellow at the Philippine Institute for Development Studies. The author is grateful for the excellent research assistance of Keith Detros.

have been assigned to specific persons rather than positions, resulting in an unsustainable operation especially when the persons assigned resign or transfer to other agencies; and (ii) a seemingly fat bureaucratic setup has emerged.

- Econometric regression shows that household access to electricity in rural areas is associated with a 36% increase in per capita income and a 34% increase in per capita spending.
- In prioritizing beneficiaries, the SEP uses a "least cost" approach whereas the HEP uses a "highest benefit" approach.
- The accelerated meeting of the SEP master plan targets is starting to show that the absorptive capacity of the NEA and ECs is being overstretched. Decision-makers must note that targeting beyond the absorptive capacity of agencies should entail innovative interventions and mechanisms to address the sudden increase in the number of procurement activities, as well as monitoring and evaluation tasks.

We find that the current design and implementation of the SEP and the HEP can still be improved. Our recommendations, which are implementable in the short to medium term, are explained in the succeeding paragraphs.

We are recommending that targeting for the SEP be based on household connections rather than sitios. The sitios currently identified as unserved sitios can be used as location identifiers for the household connections being targeted. The SEP may be continued under the same name (i.e., "sitio electrification") but with the requirement that the establishment of targets be based primarily on households.

We are also recommending that monitoring of accomplishments go down to the household level for both the HEP and the SEP. It has been raised by both the DOE and the NEA that this would be difficult to do given that data being generated by all service providers are based on number of household connections and not households. We therefore recommend that monitoring and reporting of both indicators—household connections and households served—be undertaken. Since field personnel are already filing reports on household connections anyway and social preparation and community organizing are always a component of project implementation, an additional question on households served per dwelling unit connected can be included in the field reports.

Moreover, we are recommending that the social preparation and community organizing component in the institutional arrangement for the SEP be strengthened in order to: (i) identify what specifically constrains the households from connecting despite the presence of subsidies; and (ii) formulate innovative and community-supported solutions to these constraints. For example, program implementors can try to find out the answers to these questions: Do the households find the Php2,500 subsidy insufficient to cover the total cost of meters and long wiring from the electric pole to their houses? If so, are there viable amortization schemes, or innovative financing schemes for this? Are there possible micro-lending or subsidy sources? If there are already amortization schemes being implemented by electric cooperatives, can these be made more affordable? A more robust social preparation activity coupled with innovative financing schemes supported by the community (or cluster of targeted households) can help analyze and address this "willingness to connect" issue.

Since the Expanded Rural Electrification Team that was set up in 2003 and re-constituted in 2006 is inactive, we are recommending that the ER Team be re-activated. We are also recommending that its setup be streamlined and responsibilities be assigned to positions in offices rather than specific persons.

Since there is evidence of a positive relationship between rural electrification and poverty reduction, we are also recommending that the government's SEP and HEP be continued. We also believe that this positive relationship could be reinforced by having more targeted programs, that is, with targets based on households rather than locations (e.g., barangays or sitios).

We are also recommending improvements in the prioritization criteria. For example, the social criteria design of the SEP can include not only the presence of at least 20 potential household connections in a sitio but also the presence of local enterprises that can raise economic activities and employment (e.g., livestock production, agricultural processing and merchandising micro-enterprises). Moreover, since the connection fee still acts as a barrier for some households, the SEP criteria may include a demonstration that an EC has an affordable amortization package for the initial connection fees of households. In the HEP, on the other hand, the community associations participating in the program must also demonstrate, aside from proofs of social acceptability, that there is an affordable amortization package for households. Should there be verification issues with respect to the reported affordable amortization schemes by the ECs/community associations, program managers could verify the affordability by comparing these with the current connection fees in the area and the latest poverty threshold estimates. Addressing the willingness-to-connect issue is crucial since it prevents the poor from switching to a cheaper and more efficient source of lighting needs, despite being in a sitio or barangay that is already connected to the grid or that is already served by renewable energy systems.

The 2012 experience in the accelerated implementation of the SEP raises red flags on the absorptive capacity of the NEA and the ECs. Therefore, decision-makers may have to re-assess the absorptive capacity of the ECs and NEA in light of this experience and explore a possible downscaling of annual targets to more realistic levels and extension of the implementation period to a more realistic duration.

1 Introduction

Around three out of ten Filipino households do not have access to electricity, according to 2010 data from the Department of Energy (DOE). The national electrification rate stands at only 73.7 percent as of 2010, that is, 12.6 million electrified households out of 17.1 million households nationwide. The DOE aims to raise this electrification rate to 90 percent by 2017.

Different government agencies and development finance institutions are pitching in to achieve the electrification target. The DOE itself has a program for the energization of off-grid households using mature renewable energy technologies. The National Electrification Administration (NEA) has a sitio electrification program and a barangay line enhancement. The National Power Corporation-Small Power Utilities Group (NPC-SPUG) has generation projects for off-grid areas. The private sector participates through qualified third parties[1] and corporate social responsibility programs of power producers. The USAID-funded Alliance for Mindanao Off-grid Renewable Energy (AMORE) project complements the government's program through electrification initiatives in Mindanao. Among these programs, the Department of Budget and Management (DBM) is focusing on the DOE and NEA programs. In particular, the DBM is interested in a cost efficiency and effectiveness assessment of the DOE's household electrification program and NEA's sitio electrification program in order to inform the zero-based budgeting (ZBB) approach that the Aquino administration is adopting.

In the ZBB approach, an entity that prepares the budget must assume that there is no remaining money from the previous budgeting cycle (i.e., zero base) and it must therefore prioritize its most essential tasks and activities. This approach "requires the analysis and monitoring of whether the project and program and the amounts allocated to them are being properly used according to the approved plan" and bad or ineffective projects will be discontinued during the year, and not the next year, so that funds could be added to the successful ones.[2]

The DBM sought the assistance of the Philippine Institute for Development Studies (PIDS) in assessing selected programs for 2013 ZBB deliberations. One such program is the Philippine rural electrification program. In the terms of reference (TOR) for the study on the cost efficiency and effectiveness of the NEA's Sitio Electrification Program (SEP) and DOE's Household Electrification Program (HEP), the reference start date for the SEP is 2006 and the reference start date for the HEP is 2011. However, NEA clarified that there were no SEP subsidies yet in 2006 and this subsidy program started only in 2011. Although some sitios were being energized prior to 2011, these were not part of a well-defined sitio electrification program. Those sitios were energized since the

[1] Qualified third parties could be private companies, NGOs, cooperatives and other private entities that are willing to undertake the NPC-SPUG's mandate to provide power generation in off-grid areas. They must meet the government's eligibility criteria such as technical and financial capacities.

[2] Bas, Rene Q. 2010. "What is zero-based budgeting? What are its pitfalls?" As cited in the DBM website, accessed 30 March 2012, http://www.dbm.gov.ph/index.php?pid=3&nid=2059, originally appeared in the *Manila Times*, August 8, 2010.

distribution lines that were originally part of the rural electrification programs then had to pass through those sitios and it is economically and physically feasible to connect them. No SEP subsidies were used prior to 2011 and instead, the sitios were energized using the savings of past rural electrification programs and some legislators' Priority Development Assistance Fund (PDAF).

The main methodologies used in this study are benchmarking for the efficiency and effectiveness assessment and econometric regression for the study of poverty impacts. Since the timeframe for the program implementation was misspecified in the TOR (i.e., the SEP began only in 2011), the benchmarking exercise is applied only to 2011 implementation data but not to the pre-2011 years. We initially planned to use data envelopment analysis (DEA)[3] to find benchmarks at the electric cooperative (EC) level, as explained in the Inception Report, but we found out that there is no definite count of the number of household connections per EC that can be attributed[4] to the subsidized rural electrification programs (i.e., the output data set cannot be determined even though we are able to construct the input data set); thus, we can no longer use the DEA method. We are, nevertheless, proposing improvements to the monitoring and evaluation system to address future concerns regarding attribution of program accomplishments. NEA also stated that it is starting to monitor house connections data as a program indicator for SEP. The results of this, however, were not yet available at the time this report was written.

In the TOR, the DBM specified the following deliverables:

Phase 1 deliverables

1. Clarification report on the difference between the implementation of barangay electrification and SEP and HEP electrification program.

2. Assessment report of institutional arrangements of the SEP and HEP between DOE, NEA, electric cooperatives and the private sector in implementing SEP and HEP.

3. Assessment report on the process undertaken by the concerned agencies in the implementation of SEP and HEP and the monitoring system in place.

4. Report on the assessment of physical and financial accomplishments of DOE and NEA vis-à-vis the targets since the implementation of SEP and HEP in 2006 (NEA) and 2011 (DOE) in terms of quantity and quality.

5. Evaluation report of the cost efficiency and effectiveness of the SEP and HEP and the feasibility of reaching 90% goal of nationwide *sitio* and household electrification by 2017.

---

[3] The DEA method uses mathematical programming to establish an efficiency frontier based on cost inputs and outputs in a data set. If data were available, DEA could have been used to assess the efficiencies of electric cooperatives that were given subsidies under the sitio and household electrification programs relative to an efficiency frontier.

[4] The annual increase in number of connections currently served by electric cooperatives (ECs) may be attributed not only to subsidies received from the national government but also to the ECs' own expansion programs as well as consumer-initiated connections.

Phase 2 deliverables

1. Assessment report on the rural electrification program's impact on poverty reduction.

2. Report on standards/criteria for electric cooperatives to effectively implement SEP and HEP.

3. Policy recommendations for DOE and NEA on how best to implement SEP and HEP in terms of cost efficiency and effectiveness of the program to attain the target of 90% sitio and household electrification program by 2017.

4. Report on the SEP Master Plan review and forecast of annual funding requirements for SEP up to its 100% completion beyond 2017.

This study was also informed by the results of the focus group discussions held on May 24, 2012 and the validation workshop held on October 10, 2012.

This Final Report integrates the results of the Phase 1 and Phase 2 reviews and assessments. The Phase 1 deliverables are in Sections 1 to 5 and the Phase 2 deliverables are in Sections 6 to 8. Section 9 provides the conclusions and recommendations.

2 Clarification of Program Differences

The DBM is asking in the TOR for a clarification of how barangay, sitio, and household electrification programs differ from each other. Before these types of electrification programs are differentiated from each other, it is necessary to define the terms *barangay* and *sitio* for the avoidance of doubt.

A *barangay* (Filipino term for "village") is an administrative unit, in fact, the smallest local government unit, in the Philippines. It has geographical boundaries that are defined in government documents such as those related to taxation, census, and elections. The National Statistical Coordination Board (NSCB), defines an urban barangay as a barangay with all of the following characteristics: (i) has a population size of 5,000 or more; (ii) has at least one establishment with a minimum of 100 employees; (iii) has 5 or more establishments with a minimum of 10 employees and 5 or more facilities within the two-kilometer radius from the barangay hall. All other barangays that do not fall within this definition are considered rural barangays.

On the other hand, a *sitio* (Spanish word which can be literally translated as "site") is not an administrative unit and its characteristics and geographical boundaries are not officially defined by the government. However, it is commonly understood, especially in rural areas, that a sitio is a geographical area that is part of a rural barangay and usually distant from the center of barangay economic and social activities. The naming of sitios dates back from the Spanish occupation period and over time has lost relevance in many areas as location identifiers in barangays became streets and house numbers. Thus, not all rural barangays have sitios, not all sitios are in rural areas and there is no database of sitios officially released by the government's statistical agencies.[5] (This clarification will be crucial in contextualizing the argument of this study to have a more directed targeting system that is based on unserved households rather than unserved sitios.)

Barangay electrification programs in the past

Rural electrification programs during the past administrations had focused on "energizing" barangays. For off-grid electrification, the Department of Energy (DOE) considers that a barangay has been energized when at least 20 household connections[6] in that barangay had been energized. For on-grid electrification, a barangay is considered

[5] During the October 10, 2012 validation workshop and in the formal October 9, 2012 letter of NEA regarding the study, NEA challenged PIDS to provide definite data on the names of the rural barangays which have no sitios. We believe that this stance is quite counter-productive and reduces the discussion on targeting system to absurdities. PIDS resources will not be utilized to satisfy this NEA challenge and users of this study are encouraged to look at the logic of PIDS' arguments instead. Nevertheless, to have an example of our statement that "Not all rural barangays have sitios", one can refer to barangay Sto. Niño and other rural barangays in Naujan, Oriental Mindoro; and to have an example of our statement that "Not all sitios are in rural areas", one can refer to Sitio Talanay in Quezon City, Metro Manila.

[6] Note that in rural electrification, the number of "household connections" differs from the number of "households" because the former means electricity connection to a housing unit regardless of the number of households actually dwelling in that unit. It may be the case that more than one household are sharing one electricity meter or one solar home system.

energized when the distribution line reaches the barangay hall or barangay center.[7] Government agencies in the energy sector use the terms "energized barangay" and "electrified barangay" interchangeably.

The government launched the Accelerated Barangay Electrification Program (ABEP) in 1999. It was spearheaded by the DOE and participated in by the following government corporations: National Electrification Administration (NEA), National Power Corporation-Small Power Utilities Group (NPC-SPUG), and PNOC Energy Development Corporation.[8] Prior to the 1999 program launch, the barangay electrification rate (using the limited definition that at least 20 households are connected) stood at 76.9 percent, or 32,281 barangays of the total 41,975 barangays.[9] The ABEP was renamed the "O' Ilaw Program" in 2000 and independent power producers (IPPs) were encouraged to participate in it and include rural electrification in their corporate social responsibility.[10] The program was expanded in 2003 and renamed the Expanded Rural Electrification Program, with targets set at 100 percent barangay electrification by 2009 and 90 percent household electrification by 2017.[11] As of May 31, 2011, the number of electrified barangays stood at 41,930 barangays, or 99.89 percent barangay electrification rate given 41,975 target total barangay connections (see **Error! Reference source not found.** below).[12] The DOE also reports that the estimated household electrification rate in 2010 is 73.7 percent.[13]

Table 1: Barangay Electrification Status as of May 31, 2011

Region	Number of Barangays	Electrified Barangays	Unelectrified Barangays	Electrification Level (%)
CAR	1,176	1,176	0	100.00%
I	3,265	3,265	0	100.00%
II	2,311	2,311	0	100.00%
III	3,102	3,102	0	100.00%
IV-A	4,010	3,983	27	99.33%
IV-B	1,458	1,458	0	100.00%
V	3,469	3,469	0	100.00%
NCR	1,695	1,695	0	100.00%

[7] As defined in the October 9, 2012 letter of NEA to the DBM.

[8] 14th Electric Power Industry Reform Act (EPIRA) Implementation Status Report, April 2009.

[9] 18th EPIRA Implementation Status Report, April 2011.

[10] 14th EPIRA Implementation Status Report, April 2009.

[11] *Ibid.*

[12] This is taken from the 18th EPIRA Implementation Status Report, April 2011. In its November 23, 2012 comments, the DOE reported the same figures (i.e., 41,974 barangays electrified or 99.98 percent barangay electrification) as accomplishments as of August 31, 2012.

[13] This is from a document faxed by the DOE to PIDS. The figure, however, is not broken down by area or region.

Region	Number of Barangays	Electrified Barangays	Unelectrified Barangays	Electrification Level (%)
Subtotal Luzon	**20,486**	**20,459**	**27**	**99.87%**
VI	4,050	4,050	0	100.00%
VII	3,003	3,003	0	100.00%
VII	4,389	4,389	0	100.00%
Subtotal Visayas	**11,442**	**11,442**	**0**	**100.00%**
IX	1,904	1,904	0	100.00%
X	2,020	2,020	0	100.00%
XI	1,160	1,160	0	100.00%
XII	1,194	1,194	0	100.00%
CARAGA	1,310	1,310	0	100.00%
ARMM	2,459	2,441	18	99.27%
Subtotal Mindanao	**10,047**	**10,029**	**18**	**99.82%**
Total Philippines	**41,975** [14]	**41,930**	**45**	**99.89%**

Source: DOE, as cited in the 18th Status Report for the Electric Power Industry Reform Act (EPIRA) Implementation

At present, "90 percent household electrification by 2017" remains the government's target as evidenced by recent DOE pronouncements.[15] The current SEP and HEP by NEA and DOE, respectively, aim to contribute to meeting this target.

The Sitio Electrification Program of the NEA

The Sitio Electrification Program (SEP) of the NEA aims to energize sitios through on-grid electrification, that is, by connecting sitios to the power grid. In areas where grid connection is deemed not feasible, the NEA states that it will strongly consider renewable energy technologies. The working definition of NEA for target-setting is this: "A sitio is considered energized (on-grid) if there are at least 20 potential households to be served."[16]

[14] This is slightly less than the 42,027 total number of barangays in the Philippine Standard Geographic Code masterlist as of first quarter 2012. It is highly possible that the discrepancy is accounted for by the fact that new barangays are being created. For example, in the fourth quarter of 2008, ten new barangays were created in Taguig City in the National Capital Region (NCR) and three new barangays were created in Maguindanao province in the Autonomous Region in Muslim Mindanao (ARMM).

[15] February 9, 2012. "DOE to spend P33B on rural electrification" *Philippine Daily Inquirer*.

[16] NEA Roadmap to Electrification 2010-2015.

The program was not yet called SEP in 2006-2009, but NEA had been implementing sitio energization since 2006 by extending the distribution line to sitios using the savings of past rural electrification programs and some legislators' PDAF.

The SEP became a full-fledged program through the NEA Roadmap to Electrification 2010-2020, which sets a target of energizing 32,441 sitios, or 31 percent of 103,489 estimated total number of sitios nationwide. These figures are based on the sitio database compiled by NEA in 2008. The NEA revised this Roadmap and issued a new one, that is, the NEA Roadmap to Electrification 2010-2015, which uses the same national target of 100% sitio electrification but directs the accelerated achievement of this target to 2015. The NEA updated the list of sitios in 2011 and issued Memorandum No. 2011-021 to all ECs informing them of the updated number of sitios: 103,496 total sitios, 31 percent of which or 32,273 sitios are unenergized. Nevertheless, since the database is continuously being updated, the working annual targets are still based on the old total figure and are broken down as follows:

Table 2: Annual Targets in the Sitio Electrification Program

	Targets
2011	1,500 sitios
2012	7,500 sitios
2013	7,500 sitios
2014	7,500 sitios
2015	8,441 sitios
Total	32,441 sitios

Source: NEA Roadmap to Electrification 2010-2015

Difference between the SEP and the Barangay Line Enhancement Program

In previous meetings with DBM officials and staff, they expressed confusion about the coverage of another ongoing NEA program, that is, the Barangay Line Enhancement Program (BLEP), and how it ties up with the SEP.[17] The DBM is concerned about the possible duplication of the allocation of (or reporting of allotted) subsidies to beneficiaries under the two programs. Thus, a clarification at this point is necessary.

The NEA defines the BLEP as "the transformation of the connection strategy from *off-grid* (solar or small generating sets) to *on-grid* (EC distribution lines)" and states that "barangays which are 'off-grid' manifested through stakeholders' correspondences that they want to be connected to the grid in order for them to take full advantage of a reliable source of electricity."[18] This means that the targets of the BLEP are barangays that are already energized (i.e., using the definition of DOE that a barangay is already energized when at least 20 households in it have electricity connection) but are not yet connected to the grid. Thus, the intervention is to extend the distribution line from a

[17] As expressed by DBM officials and staff during the February 28, 2012 meeting and May 3, 2012 pre-submission (of draft ZBB studies) workshop at the DBM.

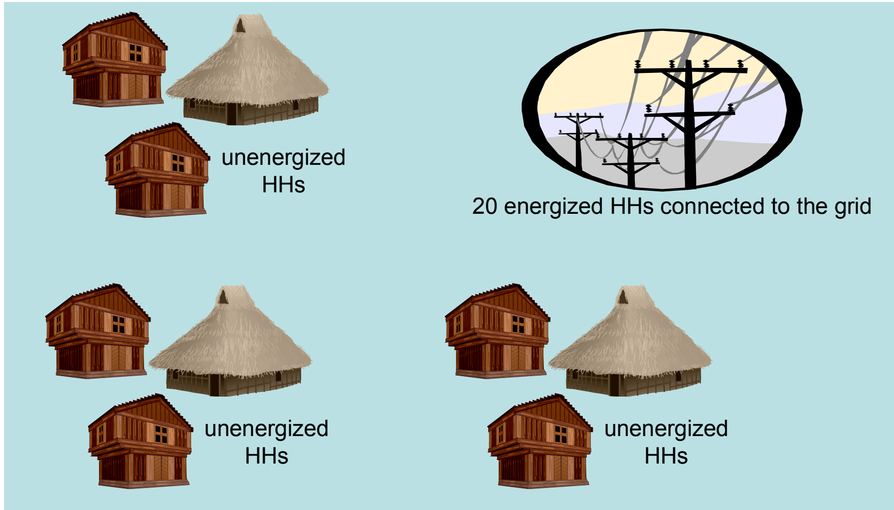
[18] NEA Roadmap to Electrification 2010-2015.

tapping point to the cluster of electrified households in that barangay. NEA targets 2,341 barangays under the BLEP. **Error! Reference source not found.** illustrates a possible intervention under the BLEP.

Figure 1: A possible intervention under the Barangay Line Enhancement Program

Before BLEP
(an energized barangay)

After BLEP
(an energized barangay with line enhancement)



Source: Author's interpretation

Twenty households are a small number compared to the possible household population in a barangay. Note that a rural barangay can have as many as 999 households given that the average Filipino household consists of five members (as of 2007 census) and a barangay with a population of below 5,000 is considered rural. Thus, it is highly likely that many "energized barangays" have numerous households without electricity and still need intervention. It is also possible that the barangay targeted under the BLEP intervention is also the barangay wherein the sitios targeted under the SEP intervention are located, but **the households targeted under the two programs should not be the same**, or there should not be a duplication of funds allocation to the same beneficiaries. Section 4 shows that there had been no duplication.

Figure 2 illustrates a plausible scenario wherein a barangay under the BLEP intervention is also a barangay wherein the sitios targeted under the SEP intervention are located. In this scenario, the two programs target different beneficiary households.

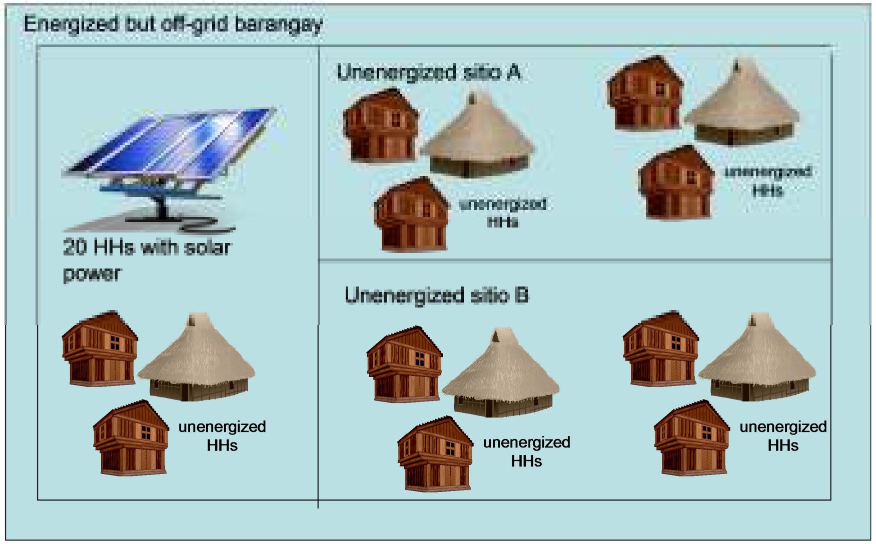
In Figure 2, before the interventions, a barangay may be energized but it is not yet connected to the grid and is thus eligible under BLEP. Furthermore, when there are unenergized sitios in that barangay and such sitios have at least 20 households that can be energized, that barangay is (or more specifically, the sitios in that barangay are) eligible under SEP. After the BLEP intervention, the originally energized cluster of households in that energized barangay should have been connected to the grid through line extensions from the nearest tapping point. After the SEP intervention, the previously unenergized households in the sitios should have been energized either through grid connection/line extension also or via off-grid power systems such as solar power. Thus, there would be no duplication of household beneficiaries.

Figure 3 illustrates the case wherein only SEP intervention is being done. A barangay is already energized and grid-connected in the sense that a cluster of 20 households in that barangay are already served by distribution lines branching out from a tapping point connected to the grid. However, there are unenergized sitios in that barangay and such sitios have at least 20 potential household connections. Thus, these sitios are eligible under the SEP. After the SEP intervention, the previously unenergized households in the sitios should have been energized either through grid connection/line extension or via off-grid power systems such as solar power.

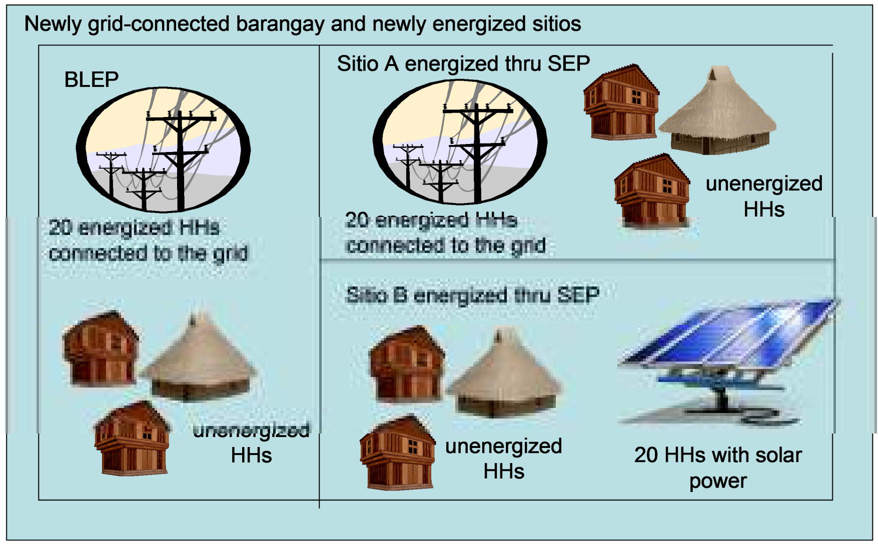
The illustration of a case wherein the target sitios under the SEP are in an unenergized barangay is no longer included here given that achieving 100 percent barangay energization is imminent.

Figure 2: Illustration of BLEP and SEP in the same barangay but with different targets

Before BLEP and SEP



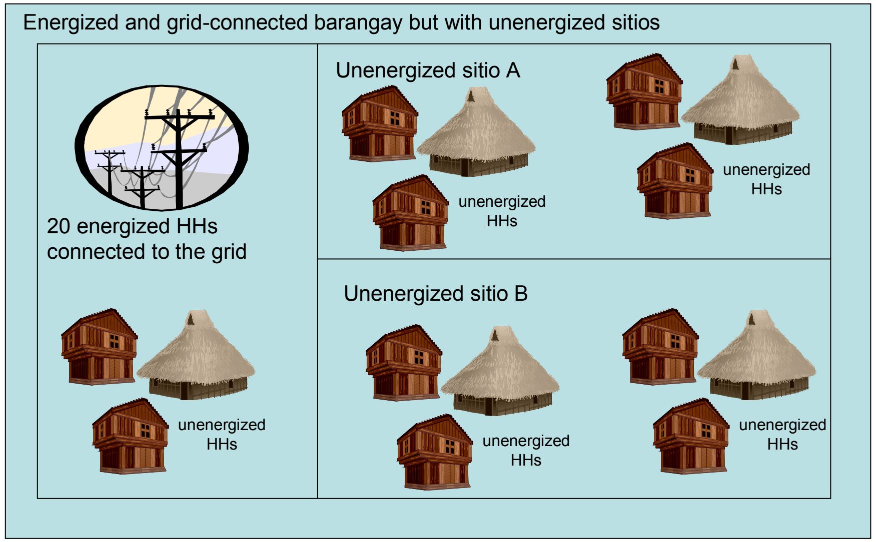
After BLEP and SEP



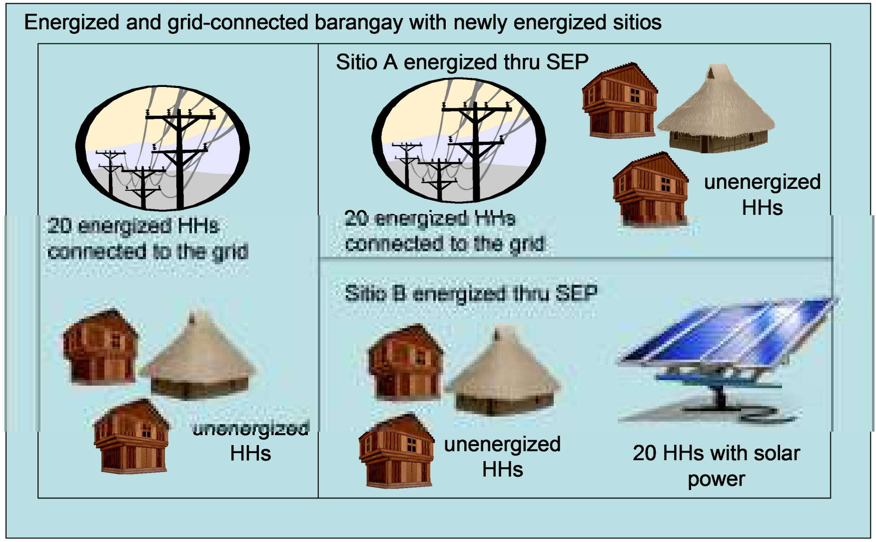
Source: Author's interpretation

Figure 3: Illustration of SEP with no BLEP

Before SEP



After SEP



Source: Author's interpretation

The Household Electrification Program of the DOE

The subsidy program is officially referred to in budget documents as the "Household Electrification Program in Off-Grid Areas Using Renewable Energy Systems". According to the DOE, "the Household Electrification Program (HEP) involves the energization of off-grid households using mature renewable energy technologies such as photovoltaic (PV) solar home systems, photovoltaic streetlights and micro-hydro systems."[19] This means that unlike the SEP which primarily aims for grid connection, the HEP primarily aims to address the electrification needs of households which are in areas where grid connection is currently not feasible. The DOE also implemented the Rural Power Project funded through the World Bank's adaptable program loan 1 (APL1) and global environment facility (GEF) but this has targets different from the subsidy program. The World Bank-funded program ended on December 31, 2012.

The DOE's HEP is also designed to contribute to attaining the target of 90 percent household electrification rate nationwide by 2017. The DOE plans to contribute to the achievement of this target by energizing **at least 2,000 households every year[20]**.

In practice, the DOE does not only energize households but also sets up communal photovoltaic systems. In 2011, for example, the DOE funded the energization of 2,750 households and installation of 46 communal photovoltaic systems. For 2012, the DOE targeted the energization of 3,200 households and installation of 75 communal photovoltaic systems.[21]

Noting that the NEA via the SEP will also consider off-grid energization in sitios where grid connection is not feasible, one may ask whether or not some HEP targets could duplicate the targets in the SEP. According to the DOE, this is not possible since it counterchecks its targets against the targets of other agencies and organizations implementing rural electrification projects (i.e., the NEA, NPC-SPUG, and private companies and utilities). Besides, the entity that will directly handle the procurement of renewable energy systems under the HEP is the DOE itself whereas the entities that will directly handle such procurement under the SEP are the ECs.

[19] DOE-Solar and Wind Energy Management Division. March 2012. "DOE's HEP: Frequently Asked Questions"

[20] *ibid.*

[21] As explained in the material "DOE's HEP: Frequently Asked Questions" shared by the DOE with PIDS and as detailed in the "Summary of HEP Beneficiary Areas: 2012 Accomplishments for CY 2011 Funding," also shared by the DOE with PIDS.

3 Institutional Arrangements and Implementation and Monitoring Procedures

In the TOR, the DBM is asking for an assessment report of the institutional arrangements as well as an assessment report of the implementation and monitoring processes. Because the institutional arrangements directly affect how the actual implementation and monitoring of the SEP and the HEP are undertaken, this section combines the two required assessments. This section also differentiates how the flow of funds in the SEP differs from that of the HEP.

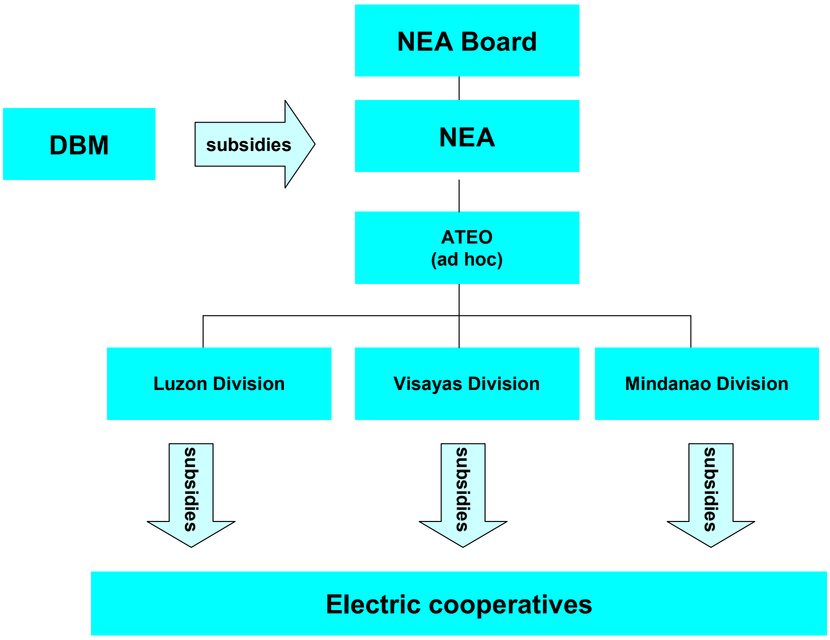
The DBM is also asking for an assessment of the arrangement with the private sector in implementing the SEP and HEP. It is being clarified that aside from the collaboration of Team Energy Foundation, Inc. with the DOE for the social preparation component of the HEP, the private sector has no major role in the SEP and HEP. The private sector groups implementing rural electrification programs (i.e., the qualified third party program for the NPC-SPUG areas and the corporate social responsibility programs of IPPs) have no roles in implementing the SEP and HEP.

The NEA-SEP

Funding for the SEP (as well as the BLEP) is in the form of national government subsidy to the NEA (see

Figure 4). The subsidy appears in the General Appropriations Act under "Budgetary Support to Government Corporations." The NEA, which is mandated as a special financing institution for electric cooperatives (ECs) and has long been the primary lender to ECs, conveys the funds as subsidies, rather than loans, to ECs eligible under the SEP.

Figure 4: Institutional arrangement for the NEA-SEP



Source: NEA

The institutional arrangement in

Figure 4 is also being used for the BLEP. The NEA set up the ad hoc Accelerated Total Electrification Office (ATEO) to implement the SEP and BLEP. The ATEO was previously under the Engineering Department of NEA but it is now an office directly under the Deputy Administrator for Electric Distribution Utilities Services. The ATEO has three divisions, each for Luzon, Visayas and Mindanao.

The ECs directly undertake the electrification of sitios. Monitoring is supposed to be through reporting by ECs to NEA. However, in response to our request for monitoring reports, no annual figures on household connections made possible by the SEP were provided by NEA to PIDS. We found out from the NEA website that what are available are reports on annual cumulative connections per electric cooperative regardless of whether the connections were made possible because of subsidies or the ECs' internally generated funds. Nevertheless, we looked for alternative sources of actual program accomplishments and we learned that even the monitoring reports on rural electrification being tracked by the EPIRA Status Reports do not have household connections as monitoring indicators. What is being tracked in the EPIRA Status Reports is the number of barangays electrified, and there is no explicit explanation that the definition of electrification is limited to the "20 household connections" rule.

During the May 24, 2012 focus group discussion (FGD) at PIDS, the Philippine Rural Electric Cooperatives Association Inc. (PHILRECA) representative explained why ECs consider a barangay/sitio already energized even though not 100 percent of households are electrified. He explained that what ECs are saying when an area is deemed energized is that distribution lines are already reaching that area. He explained that electrification ultimately depends on the decision of households to connect and this willingness to connect depends in turn on the households' capability to pay.

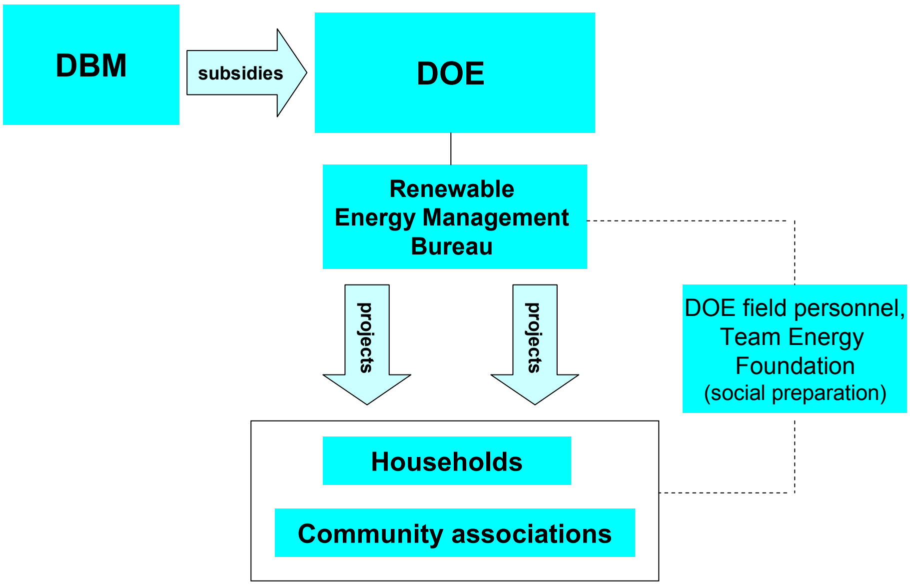
The DOE-HEP

Similar with the SEP, the HEP is funded by national government subsidies.[22] The subsidy is part of the DOE's budget item Locally Funded Projects. The budget is essentially coming from the DOE's Special Account in the General Fund. Per PD 910, the DOE is authorized to collect "fees, revenue and receipts from any and all sources including receipts from service contracts and agreements such as application and processing fees, signature bonus, discovery bonus, production bonus, collection from concessionaires, representing unspent work obligations, fines and penalties, royalties, rentals, production share on service contracts and similar payments on exploration, development and exploitation of energy resources." These collections have been constituted as "a Special Account in the General Fund - Fund 151 of the DOE to be used to finance energy resource development and exploration programs and projects of the government and for such other purposes as may be directed by the President of the Philippines." These purposes now include household electrification in off-grid areas.

But unlike in the SEP wherein subsidies reach the field, in the case of the HEP, what reaches the field are projects or actual installation of power systems by the DOE. (see Figure 5)

[22] In a comment sent on Noveber 21, 2012 to PIDS, the DBM clarified that the HEP is funded not through subsidies but through the DOE's Special Account in the General Fund (Fund 151). We maintain, however, that this still constitutes subsidies because the source of funds is essentially a public resource.

Figure 5: Institutional arrangement for the DOE-HEP



The DOE procures the hardware component as well as the shipment and installation services for the power systems. It also provides for the technical training of users and technicians. The DOE undertakes the social preparation and community organizing component through its field personnel and in collaboration with Team Energy Foundation, Inc. (TEFI). TEFI takes charge of the corporate social responsibility activities of TeaM Energy, an IPP that is formed out of a partnership between Tokyo Electric Power Company and Marubeni Corporation.

The DOE directly implements the HEP through its three field offices—the Luzon, Visayas and Mindanao field offices, each of which implements all the mandates of the DOE including rural electrification. The DOE assigns field personnel to take charge of all stages of project activities—development and identification of beneficiaries, inventory, implementation, and monitoring. The DOE also coordinates with local government units (LGUs) and ECs during project implementation, although the May 24 FGD participants from the DOE admitted that there had been cases in the past when ECs had been bypassed by their field personnel, or cases when partnership with LGUs presented challenges and delayed the projects. They were quick to point out though that the DOE now requires the participation of ECs in the projects, that is, no participation of the EC means the DOE will not prioritize the area.

Once the projects are completed, the DOE turns over the renewable energy systems to community power associations, which are composed of household beneficiaries, for operation and maintenance. The community power associations are expected to manage the systems sustainably using membership fees.

During the May 24 FGD, the DOE representatives reported that household connections are being monitored and they have a database[23] for this. They agreed, however, with the

[23] Such database was not shared with PIDS.

PIDS' observation that the national-level mapping of accomplishments that reaches policymakers is the barangay energization level per region rather than actual household connections or actual percentage of household connections per region. The DOE representatives also discussed the difficulty of monitoring total accomplishments given that there are different projects involved in the total rural electrification effort. They also mentioned that programs have different monitoring standards. For example, in one ODA-funded rural electrification project where a contractor was obliged to sell the renewable energy system to a minimum of 30 households in a barangay, the monitoring report that reached the DOE was on the number of communal systems already set up; however, the DOE monitoring units did not know how many households already bought power units from the contractor and thus they merely assumed that the barangay had been electrified and 30 households had been served.

Assessment

As currently designed, the SEP lacks a strategy for addressing community and household concerns that affect the willingness of households to connect to distribution lines despite the presence of NEA's consumer connection program providing a Php2,500 subsidy per household for the meter, house-wiring and light bulbs.[24] With respect to this "willingness to connect" issue, it seems that the program implementors are caught in a circular reference trap (i.e., the outcome is an input to achieve the outcome). Circular referencing happens in this manner: to increase electricity access and thereby help reduce poverty in hard-to-reach and poverty-stricken sitios, line extension to sitios under the SEP is being implemented; but actual electrification is low because in the first place, the households are poor and cannot afford to connect to such lines. If this circular referencing continues, we will also continue to have limited accomplishments—that is, mere installation of distribution lines but with only a few houses connecting.

One possible way to get out of this trap is to strengthen the social preparation and community organizing component in the institutional arrangement for the SEP in order to: (i) identify what specifically constrains the households from connecting despite the presence of subsidies; and (ii) formulate innovative and community-supported solutions to these constraints. For example, program implementors can try to find out the answers to these questions: Do the households find the Php2,500 subsidy insufficient to cover the total cost of meters and long wiring from the electric pole to their houses? If so, are there viable amortization schemes, or innovative financing schemes for this? Are there possible micro-lending or subsidy sources? If there are already amortization schemes being implemented by electric cooperatives, can these be made more affordable? A more robust social preparation activity coupled with innovative financing schemes supported by the community (or cluster of targeted households) can help analyze and address this "willingness to connect" issue.

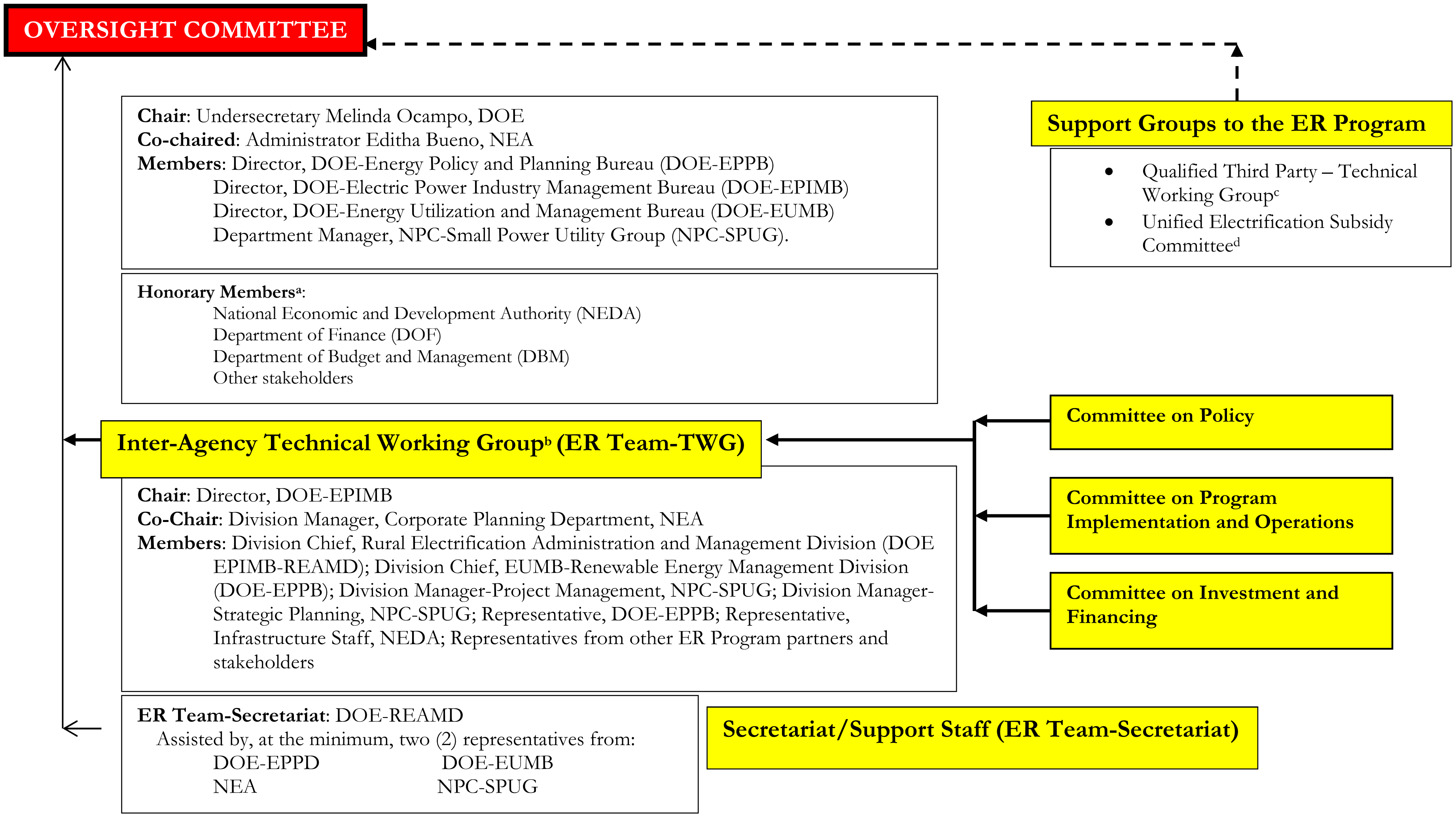
In the case of the HEP, there is a social preparation component and a defined institutional arrangement for it, but there are no monitoring reports that could tell us whether this arrangement is successful or not.

[24] The maximum number of beneficiaries per sitio is 30 households.

We also note that coordination by an overall program team for all the electrification efforts in the country is currently lacking. An Expanded Rural Electrification Team, called ER Team by the DOE, was set up in 2003 and re-constituted in 2006 but this team is currently inactive. According to the participants to the May 24, 2012 FGD at PIDS, persons rather than positions/offices are named in the ER Team and the departure of these persons from the concerned agencies led to the inactivity of the ER Team.

We examined the department circular issued by the DOE to create the ER Team as well as the department circular issued to amend it. Department Circular (DC) No. 2003-04-004 signed by then DOE Secretary Vicente Perez directed that the ER Team-Oversight Committee be composed of: Oversight Chairman - Cyril C. del Callar, DOE Undersecretary; Program Managers - Julinette M. Bayking of NEA, Mylene C. Capongcol of DOE, and Lorenzo S. Marcelo of NPC-SPUG; and Members - representatives from PNOC-EDC, PNOC, NPC-SPUG, NEA, Office of the DOE Secretary, NEDA, and DOF. DC 2003-04-004 also created an Inter-Agency Technical Working Group and a Secretariat. Three years after, DOE Secretary Raphael Perpetuo Lotilla issued DC 2006-04-003 amending the ER Team composition and reconstituting the Oversight Committee as follows: Chairperson - Melinda Ocampo, DOE Undersecretary; Alternate Chairperson - Editha Bueno, NEA Administrator; Members - Director of Electric Power Industry Management Bureau (DOE), Director of Energy Policy and Planning Bureau (DOE), Director of Energy Utilization and Management Bureau (DOE), and Department Manager of NPC-SPUG. DC 2006-04-003 expanded further the ER Team by including other committees and support groups and formalizing the inclusion of other groups created in previous department circulars. Figure 6 below shows the final setup.

Figure 6: The ER Team setup prescribed by Department Circular 2006-04-003



Notes for Figure 6:

(a) Other stakeholders in rural/missionary electrification including the Philippine National Oil Company (PNOC), PNOC-Energy Development Corporation (PNOC-EDC), and private power producers involved in electrification may become honorary members
(b) ER Program TWG shall form the committees on Policy, Program Implementation and Operations, and on Investment and Financing. The members of the committee shall be selected by the ER Program TWG with the basis of qualifications/guidelines approved by the ER Team.
(c) Formed under DOE Department Circular NO. DC 2005-12-011. Qualified Third Parties (QTPs) are parties who are willing to undertake the NPC-SPUG's mandate to provide power generation in off-grid areas. QTPs could be private companies, NGOs, cooperatives and other private entities.
(d) Formed under DOE DC No. 2004-05-005, Section 6(d)

Given the many programs for rural electrification, the lack of a coordinating body may lead to unorganized strategies, unresponsiveness to changes, inadequate monitoring of targets, weaker solicitation of contributions from the private sector, and eventually lower likelihood of meeting the 90 percent household electrification target by 2017. To coordinate all the rural electrification efforts in the country, there is a need to reactivate the ER Team. However, it can be gleaned from Figure 6 that DC 2006-04-003 created a quite expansive ER Team and established many groups and committees. It is well known that a fat bureaucratic setup spreads out responsibilities to too many persons and divides the channels of communications to too many groups and layers of authority such that accountability mechanisms can become diluted and the focus on the achievement of objectives can become less direct. For this reason, while we are not making judgment on the commitment of the persons assigned to the ER Team, we are recommending that the reactivated ER Team have a simplified and streamlined setup in order to give the team more focus and greater accountability.

For the institutional setup to be sustainable, this study is also recommending that the assignment of leadership and membership be to positions in offices concerned rather than to specific persons. DC 2006-04-003 started to do this but only for the levels below the Oversight Committee Chairperson and Alternate Chairperson. It is possible that the DOE had difficulty assigning positions rather than specific names to the Oversight Committee Chairperson because the setup at the DOE higher management is that the undersecretaries are not named by the type of office they handle, unlike in other agencies such as the National Economic and Development Authority where the Deputy Director-Generals (DDG) have specific assignment of offices (e.g., DDG for Planning, DDG for Investment Programming, etc.). It is recommended that this difficulty be addressed by assigning the leadership of the ER Team to the DOE Undersecretary overseeing the Energy Policy and Planning Bureau. The alternate chairperson can be assigned to the NEA Administrator. The department circular to be issued for re-activating the ER Team need not name the specific persons currently holding these positions, but if the wish of the DOE is to do so, it must ensure that the circular provides that in the event that the current DOE Undersecretary overseeing the Energy Policy and Planning Bureau and the current NEA Administrator officials are replaced, the replacements shall be automatically considered the new chairperson and co-chairperson, respectively. The emphasis on the Energy Policy and Planning Bureau must not be construed as implying that it is above other DOE bureaus; this only means that this bureau must exert extra effort in ensuring that policy formulation, plan development, and program designs are responsive to the development objective of increasing Filipinos' access to electricity and reaching the unserved areas in the country.

On monitoring accomplishments, it is evident from existing reports as well as the admission by FGD participants that there is a need to improve the monitoring system. The more useful monitoring indicator is actual household connection rather than electrified barangay/sitio given that the former reflects the actual service rendered. One way to compel program implementors to faithfully integrate this monitoring indicator is to make it as the basis for setting targets.

A targeting system that is based on the number and percentage of unserved households is better than a targeting system that is based on the number and percentage of unserved sitios. The NEA's good intention in setting up a sitio-based targeting system is recognized, but such system is unsustainable and does not reflect the reality in the countryside. It is unsustainable because there is no official registry of sitios in the

Philippine Standard Geographic Code list nor an official database in the Philippine statistical system which could serve as basis for an independent third-party verification of targets and accomplishments. Based on experience, the number of sitios is changing every time the NEA updates its database because this is based on the voluntary submissions of ECs. Such targeting system could also be unsustainable if the lack of verifiability would strengthen the tendency of those being monitored to cheat. Moreover, it does not reflect reality because not all rural barangays have sitios[25] and there might be some clusters of unserved households in rural barangays which are not called sitios but are called "purok" (can be literally translated as "zone"), or clusters of unserved households which are not named at all as a sitio or purok. **These households could be excluded in a sitio-based targeting system and such exclusion is unjust**. That a sitio is considered energized when the lines have been made available for "potential" connections of 20 households will also not reflect the reality that many households continue to be unserved.[26]

The participants during the May 24 FGD explained that the targeting system is now based on number of households. We maintain, however, that what is being currently presented by the DOE is not enough because the household-based target is a national-level target and not mapped by area, e.g., by region, province or municipality.

The FGD participants were also concerned that the number of households being targeted will be moving targets because population is growing and this will make monitoring difficult. We believe, however, that this is a minor point and can be easily solved by annotating reports to explain such aspects as population growth, and can even be more easily solved if the target will be in terms of percentage of households. In other infrastructure sectors, targeting based on percentages is the norm. For instance, in the water supply sector, the percentage of households without access to potable water is the basis of targets. Another example is in the telecommunications sector where the target is based on teledensity, e.g., actual number of Filipinos with landlines per 100 Filipinos, or actual number of Filipinos with cellular phones per 100 Filipinos (alternatively, percentage of Filipinos with landlines or percentage of Filipinos with cellular phones).

Another difficulty that was raised during the FGD is the fact that the data being generated by all service providers (i.e., electric cooperatives, private distribution utilities and LGU-run utilities) are based on number of household connections and not households. As explained in Section 2 of this study, the term "household connection" means electricity connection to a housing unit regardless of the number of households actually dwelling in that unit and there are many cases wherein more than one household are sharing one electricity meter or one power system. Thus, the actual and potential number of household connections will always differ from the NSCB count of the

[25] As mentioned in Section 2, during the October 10, 2012 validation workshop and in the formal October 9, 2012 letter of NEA regarding the study, NEA challenged PIDS to provide definite data on the names of the rural barangays which have no sitios. We believe that this stance is quite counter-productive and reduces the discussion on targeting system to absurdities. PIDS resources will not be utilized to satisfy this NEA challenge and users of this study are encouraged to look at the logic of PIDS' arguments instead. Nevertheless, to have an example of our statement that "Not all rural barangays have sitios", one can refer to barangay Sto. Niño and other rural barangays in Naujan, Oriental Mindoro.

[26] In contrast, the DOE is more encouraging with respect to the recommendation that the targeting system be household-based. In its November 23, 2012 comments, the DOE noted that targeting households is better than targeting sitios. Moreover, accomplishments could eventually become higher than targets since previously unlisted sitios could be uncovered during SEP implementation.

number of households. We maintain that this difficulty can be solved by requiring the monitoring and reporting of both indicators—household connections and households served. During the validation workshop for the study's results on October 10, 2012, NEA representatives resisted this idea and argued that the ECs, as their mandate dictates, are concerned with kilowatt-hour meters, not population, and therefore cannot engage in household surveys. We are clarifying that it is not household surveys per EC that we are advocating; rather, we are recommending that every time connections are made and meters are installed, the number of connections actually made and the households served by those connections will be included by the field personnel as they file their monitoring reports. The aggregate of these data can then be reported at the EC level.

The DBM's comment sent on November 21, 2012 regarding the use of household connections as indicator is also not encouraging. It was raised that "the DOE may have the means of obtaining the number of households served if they would indicate data during their Rapid Rural Appraisal/Survey (RRA). However, considering the rapid population growth rate and the long period of implementation of the project (from the conduct of RRA up to the actual installation of the Renewable Energy Systems), the data obtained in the survey may no longer be accurate." We maintain, however, that though the accuracy of data may be affected by population growth and the time gap between the survey date and actual project implementation, having information on household connections and households served would be better than having no information at all, or better than merely having numbers of barangays or sitios connected and with the number of household connections estimated as simply 20 households per barangay or sitio. It is better to be armed with actual figures at the household level than be blind about the actual state of affairs when setting policies, programs and targets. The accuracy of data that the DBM is raising is a minor point and can be addressed through proper annotation of reports during status reporting and through monitoring and verification procedures during ex post evaluation.

4 Financial and Physical Accomplishments

Based on monitoring reports made available to us by the NEA, we summarize the financial and physical accomplishments under the program as follows:

Table 3: Financial and Physical Accomplishments of the NEA-SEP, 2011

Year	Subsidies allotted to ECs	Physical accomplishments	
		Number of sitios	Number of household connections
2011	Php806.83 million	1,520	30,186

Note: As explained earlier, the TOR reference date was misspecified and there was no SEP yet prior to 2011.

Source: NEA

During the May 24 FGD, the DBM representative explained that the NEA practice is simply to multiply the number of sitios energized with 20 households and report the product as the accomplishment.

It may be recalled from Section 2 that the working definition of NEA for target-setting is this: "A sitio is considered energized (on-grid) if there are at least 20 potential households to be served." Note, however, that the NEA uses the phrase "potential households to be served" rather than "households that had been served." Thus, this permits the slack practice of simply multiplying the number of energized sitios by 20 households. It is quite obvious that this practice could result in overstating or understating of actual accomplishments, or not knowing at all what the actual accomplishment had been.

With respect to the use of "potential households" in reporting the accomplishments, NEA representatives explained during the October 10, 2012 validation workshop that this is because there could be cases wherein less than 20 households served would be connected in a sitio even if the pre-implementation assessment indicated that there were 20 potential households to be served. NEA wants to consider these cases ex-post as energized. We maintain that this practice will obscure the monitoring of actual accomplishments. We maintain that targeting a certain number of household connections (and if possible, households served) and reporting the accomplishments based on household connections (and if possible, households served) will discourage the overstatement or understatement of actual accomplishments.

Nevertheless, in 2011, the reports for SEP indicated that the program was able to energize 1,520 sitios and this resulted in a total of 30,186 electrified household connections. Table 4 provides the regional and provincial breakdown of this accomplishment.

Table 4: SEP Accomplishments by Region and Province in 2011

Region	Province	Electric Cooperative	Target	Accomplishment	
				Sitios	Connections
I	Ilocos Norte	INEC	16	17	102
	Ilocos Sur	ISECO	12	12	123
	La Union	LUELCO	15	15	288
	Pangasinan	PANELCO I	4	4	37
		PANELCO III	10	11	110
		Subtotal	**57**	**59**	**660**
II	Batanes	BATANELCO	7	7	118
	Cagayan	CAGELCO I	9	9	209
		CAGELCO II	1	3	118
	Isabela	ISELCO I	15	15	720
	Nueva Vizcaya	NUVELCO	27	27	873
	Quirino	QUIRELCO	28	38	647
		Subtotal	**87**	**99**	**2,685**
III	Aurora	AURELCO	25	18	385
	Nueva Ecija	NEECO I	10	10	507
		NEECO II - Area I	17	17	551
	Pampanga	PELCO I	9	11	512
	Peninsula	PENELCO	6	12	112
	Tarlac	TARELCO I	48	49	568
		TARELCO II	8	8	179
	Zambales	ZAMECO I	9	9	225

Region	Province	Electric Cooperative	Target	Accomplishment	
				Sitios	Connections
		ZAMECO II	8	8	214
		Subtotal	**140**	**142**	**3,253**
CAR	Abra	ABRECO	8	8	64
	Ifugao	IFELCO	7	7	177
	Kalinga Apayao	KAELCO	11	11	260
	Mt. Province	MOPRECO	10	10	165
		Subtotal	**36**	**36**	**666**
IV-A	Batangas	BATELEC I	10	10	171
		BATELEC II	4	4	199
	Laguna	FLECO	10	10	94
	Quezon	QUEZELCO II	4	4	60
		Subtotal	**28**	**28**	**524**
IV-B	Busuanga Is.	BISELCO	4	4	168
	Lubang Is.	LUBELCO	2	2	60
	Marinduque	MARELCO	30	30	291
	Occ. Mindoro	OMECO	30	30	610
	Or. Mindoro	ORMECO	45	45	978
	Romblon	ROMELCO	6	6	193
	Tablas Is.	TIELCO	4	4	84
		Subtotal	**121**	**121**	**2,384**
V	Albay	ALECO	6	6	96
	Camarines Norte	CANORECO	9	9	133
	Camarines Sur	CASURECO I	5	5	80

Region	Province	Electric Cooperative	Target	Accomplishment	
				Sitios	Connections
		CASURECO IV	11	21	380
	Catanduanes	FICELCO	6	3	24
	Masbate	MASELCO	10	10	300
	Sorsogon	SORECO I	35	35	534
		SORECO II	14	14	372
	Ticao Is.	TISELCO	2	1	11
		Subtotal	**98**	**104**	**1,930**
		SUBTOTAL LUZON	**567**	**589**	**12,102**
VI	Aklan	AKELCO	7	7	238
	Antique	ANTECO	18	18	320
	Capiz	CAPELCO	41	41	290
	Iloilo	ILECO I	17	22	392
		ILECO II	58	58	263
		ILECO III	10	13	227
	Negros Occ.	NOCECO	2	2	47
		VRESCO	22	22	140
		Subtotal	**175**	**183**	**1,917**
VII	Bantayan Is.	BANELCO	31	31	509
	Bohol	BOHECO II	5	5	124
	Cebu	CEBECO I	16	16	277
		CEBECO II	19	29	454
		CEBECO III	16	16	194
	Negros Or.	NORECO I	3	3	98

Region	Province	Electric Cooperative	Target	Accomplishment	
				Sitios	Connections
	Siquijor	PROSIELCO	5	5	30
		Subtotal	**95**	**105**	**1,686**
VIII	Biliran	BILECO	7	7	159
	Leyte	DORELCO	30	44	700
		LEYECO IV	18	18	514
		LEYECO V	9	9	187
		SOLECO	2	2	31
	Samar	ESAMELCO	5	5	100
		NORSAMELCO	9	9	132
		SAMELCO I	3	3	90
		SAMELCO II	11	11	197
		Subtotal	**94**	**108**	**2,110**
		SUBTOTAL VISAYAS	**364**	**396**	**5,713**
IX	Zambo. City	ZAMCELCO	32	18	327
	Zambo. Norte	ZANECO	34	23	260
	Zambo. Sur	ZAMSURECO I	3	26	710
		ZAMSURECO II	12	14	529
		Subtotal	**81**	**81**	**1,826**
X	Camiguin Is.	CAMELCO	30	30	97
	Bukidnon	BUSECO	15	33	536
		FIBECO	30	35	438
	Lanao Norte	LANECO	30	44	360
	Misamis Occ.	MOELCI I	22	22	242

Region	Province	Electric Cooperative	Target	Accomplishment	
				Sitios	Connections
		MOELCI II	25	25	442
	Misamis Or.	MORESCO I	37	37	766
		MORESCO II	11	11	198
		Subtotal	**200**	**237**	**3,079**
XI	Davao Norte	DANECO	10	7	54
	Davao Sur	DASURECO	10	20	747
	Davao Or.	DORECO	17	21	237
		Subtotal	**37**	**48**	**1,038**
XII	Cotabato	COTELCO	6	13	408
	S. Cotabato	SOCOTECO I	13	13	616
		SOCOTECO II	10	10	92
	Sultan Kudarat	SUKELCO	5	5	111
		Subtotal	**34**	**41**	**1,227**
ARMM	Basilan	BASELCO	19	13	282
	Maguindanao	MAGELCO	13	20	605
		Subtotal	**32**	**33**	**887**
CARAGA	Agusan Norte	ANECO	25	25	1,708
	Agusan Sur	ASELCO	20	20	1,041
	Dinagat Is.	DIELCO	10	10	405
	Siargao Is.	SIARELCO	18	18	353
	Surigao Norte	SURNECO	13	13	605
	Surigao Sur	SURSECO I	3	3	63
		SURSECO II	6	6	139

Region	Province	Electric Cooperative	Target	Accomplishment	
				Sitios	Connections
		Subtotal	95	95	4,314
		SUBTOTAL MINDANAO	479	535	12,371
		GRAND TOTAL	1,410	1,520	30,186

Source: NEA

It may be recalled from Section 2 that the DBM is concerned about the possible duplication of the allocation of (or reporting of allotted) subsidies to beneficiaries under the SEP and the BLEP. The DBM is asking: since the BLEP is using connection to the grid as a strategy and the SEP also aims to connect households to the grid, is it possible that accomplishments reported under the BLEP and SEP are the same beneficiaries? Based on our examination of the 2011 report on subsidies, there was no duplication of funds allocation in any sitio/barangay.

Financial and physical accomplishments of the DOE-HEP, 2011

In the case of the DOE-HEP, the budget for 2011 is Php116.7 million but this was not used to electrify any households in 2011. The physical accomplishment in 2011 was made possible by the Php98.76 million savings from the 2009 budget.[27] No 2010 budget for household electrification was released. The 2011 budget release was used in the 2012 HEP implementation.

Using the 2009 budget, the DOE was able to accomplish the following in 2011 (see Table 5 for the details):

- 2,750 households electrified
- 40 photovoltaic streetlights installed
- 6 communal photovoltaic systems installed

[27] According to the DOE, although the budget was from 2009, the contracts were approved only in 2010, and thus the implementation was from 2010-2011.

Table 5: HEP Accomplishments in 2010-2011

	Municipality	Province	No. of Households (HHs)	PV Communal solar systems	PV Streetlight	EC Franchisee (and no. of HHs)
LUZON = 648 households						
Sitio Cabalisian, Brgy. Sta. Maria East	San Nicolas	Pangasinan	16	0	0	PANELCO 3 (16 HH)
Sitio Barakbak-Banaba, Brgy.Villa Floresta	San Jose City	Nueva Ecija	56	0	1	SAJELCO (116 HH)
Sitio Dela Cruz, Brgy. Villa Marina	San Jose City	Nueva Ecija	5	0	0	
Sitio Dela Cruz, Brgy. Culaylay	San Jose City	Nueva Ecija	6	0	0	
Sitio Maasip, Brgy. Tayabo	San Jose City	Nueva Ecija	20	0	0	
Sitio Linamuyak-Benggaso, Brgy. Sto. Nino 3rd	San Jose City	Nueva Ecija	24	0	0	
CLSU-AREC, Wind Anemometer Sites	San Jose City	Nueva Ecija	3	0	1	
CLSU-AREC, Wind Anemometer Sites	Pantabangan	Nueva Ecija	2	0	1	
Sitio Proper, Brgy. Salazar	Carranglan	Nueva Ecija	77	1	1	NEECO 2 (100 HH)
Sitio North Obito, Brgy. San Agustin	Carranglan	Nueva Ecija	23	0	0	
Sitio Makilo-Buringal, Brgy. Caluccad	Tabuk	Kalinga	124	2	1	KAELCO (258 HH)
Sitio Tangbay, Brgy. Gobgob	Tabuk	Kalinga	45	0	1	
Sitio Balay, Brgy. Tulgao West	Tinglayan	Kalinga	23	0	0	
Sitio Dalongmak-Bagtayan, Brgy. Anggacan	Tanudan	Kalinga	66	0	0	
Sitio Pat-pat-Ti-id, Brgy. Batad	Banawe	Ifugao	33	0	1	IFELCO (73 HH)
Sitio Nabnong, Brgy. Batad	Banawe	Ifugao	11	0	0	

	Municipality	Province	No. of Households (HHs)	PV Communal solar systems	PV Streetlight	EC Franchisee (and no. of HHs)
Sitio Trio, Brgy. Batad	Banawe	Ifugao	18	0	0	
Sitio Achotter, Brgy. Batad	Banawe	Ifugao	11	0	0	
Sitio Aurora, Brgy. Pato-o	Odiongan	Romblon	24	0	1	TIELCO (85 HH)
Sitio Cabibihan, Brgy. Talisay	Calatrava	Romblon	34	0	1	
Sitio Dayondong, Brgy. Cawayan	San Agustin	Romblon	27	0	1	
VISAYAS = 167 households						
Sitio Punta, Brgy. Progress	Biri	Northern Samar	17	0	0	NORSAMELCO (167 HH)
Sitio Cogon, Brgy. Macarthur	Biri	Northern Samar	39	0	0	
Sitio Cawayan, Brgy. Kauswagan	Biri	Northern Samar	33	0	1	
Sitio Langka, Brgy. Tarnate	San Vicente	Northern Samar	36	0	0	
Sitio Cabangkalan, Brgy. Destacado	San Vicente	Northern Samar	7	0	0	
Sitio Labang Baybay, Brgy. Punta	San Vicente	Northern Samar	22	0	1	
Sitio Cabil-isan, Brgy. Punta	San Vicente	Northern Samar	13	0	1	
MINDANAO = 1,935 households						
Magsaysay, Marilog Dist.	Davao City	Davao	50	0	1	DLPC (100 HH)
Bantol, Marilog Dist.	Davao City	Davao	50	0	1	
Sitio Dugayan, Brgy. Gupitan	Kapalong	Davao del Norte	24	0	1	DANECO (236 HH)
Sitio Patil, Brgy. Gupitan,	Kapalong	Davao del Norte	212	0	2	
Sitio Upper Asbangilok, Brgy. Tagaytay	Magsaysay	Davao del Sur	82	0	1	DASURECO (197 HH)
Sitio Blasan, Brgy. Malawanit,	Magsaysay	Davao del Sur	60	0	1	
Sitio Labidangan, Brgy. Upper Bala	Magsaysay	Davao del Sur	55	0	1	
Sitio Toril, Brgy. New Dumangas	T Boli	South Cotabato	52	0	0	SOCOTECO 1

	Municipality	Province	No. of Households (HHs)	PV Communal solar systems	PV Streetlight	EC Franchisee (and no. of HHs)
Sitio Lub, Brgy. New Dumangas	T Boli	South Cotabato	35	0	0	(514 HH)
Sitio Tabudtod, Brgy. New Dumangas	T Boli	South Cotabato	80	1	1	
Sitio Lamumay, Brgy. Laconon	T Boli	South Cotabato	42	0	0	
Sitio Lakag, Brgy. Laconon	T Boli	South Cotabato	93	0	2	
Sitio Upper Talahik, Brgy. Talahik	Surallah	South Cotabato	25	0	0	
Sitio Tapuk, Brgy. Moloy	Surallah	South Cotabato	30	0	2	
Sitio Lamual, Brgy. Canahjay,	Surallah	South Cotabato	62	0	1	
Sitio Lambusong, Brgy. Colongulo	Surallah	South Cotabato	26	0	0	
Sitio Ebenezer, Brgy. Rang-ay	Banga	South Cotabato	69	0	1	
Purok 1, Brgy. Halian (Island)	Del Carmen	Surigao del Norte	100	0	1	SIARELCO (175 HH)
Poblacion, Brgy. Anajawan	General Luna	Surigao del Norte	36	1	0	
Poblacion, Brgy. Suyangan	General Luna	Surigao del Norte	39	1	0	
Sitio Libertad, Brgy. San Isidro	Sibagat	Agusan del Sur	22	0	0	ASELCO (272 HH)
Purok 1, Brgy. Kioya	Sibagat	Agusan del Sur	30	0	0	
Purok 1. Brgy. Banagbanag	Sibagat	Agusan del Sur	19	0	1	
Sitio Kahayag, Brgy. Banagbanag	Sibagat	Agusan del Sur	21	0	0	
Sitio Sto. Tomas , Brgy. Anahawan	Sibagat	Agusan del Sur	22	0	0	
Sitio Mihaba, Brgy. San Marcos	Bunawan	Agusan del Sur	103	0	1	
Sitio Kilobedan, Brgy. San Marcos	Bunawan	Agusan del Sur	15	0	0	
Sitio Mambagongon, Brgy. Sabang Adgawan	La Paz	Agusan del Sur	20	0	0	
Sitio Batas, Brgy. Caimpugan	San Francisco	Agusan del Sur	20	0	0	

	Municipality	Province	No. of Households (HHs)	PV Communal solar systems	PV Streetlight	EC Franchisee (and no. of HHs)
Sitio Goling, Brgy. Tipan	Naga	Zamboanga Sibugay	29	0	0	ZAMSURECO 2 (441 HH)
Sitio Timulan, Brgy. Nazareth	Kabasalan	Zamboanga Sibugay	35	0	1	
Purok 6&7 Sitio Bulansing, Brgy. Sulo	Naga	Zamboanga Sibugay	38	0	1	
Sitio Logame, Brgy. San Antonio	R. T. Lim	Zamboanga Sibugay	34	0	1	
Sitio Motop, Brgy. Siawang	R. T. Lim	Zamboanga Sibugay	31	0	1	
Sitio Pinili, Brgy. Sto. Rosario	R. T. Lim	Zamboanga Sibugay	31	0	1	
Sitio Matanog, Brgy. Banco	Titay	Zamboanga Sibugay	30	0	0	
Sitio Looc Sioral, Brgy. Looc Labuan	Tungawan	Zamboanga Sibugay	30	0	1	
Sitio Tambis-tambis, Brgy. Batungan	Tungawan	Zamboanga Sibugay	35	0	1	
Sitio Dalanit, Brgy. Taglibas	Tungawan	Zamboanga Sibugay	31	0	0	
Sitio Banlot, Brgy. Looc Labuan	Tungawan	Zamboanga Sibugay	34	0	0	
Sitio Tandu Taib, Brgy. Labatan	Payao	Zamboanga Sibugay	19	0	0	
Sitio Busay, Brgy. Dona Josefa	Ipil	Zamboanga Sibugay	25	0	1	
Sitio Malipayon, Brgy. Upper Sulitan	Naga	Zamboanga Sibugay	39	0	1	
		TOTAL	**2,750**	**6**	**40**	

Source: DOE

5 Cost Efficiency and Effectiveness Assessment

As defined in Carin and Good (2004)[28], efficiency is cost per unit of output whereas effectiveness is measured in terms of meeting or exceeding a non-financial performance. In our cost efficiency assessment, we use the following cost efficiency measure:

Average cost per output = cost of the project / outputs of the project

For our assessment of effectiveness, we compare how well the NEA and DOE were able to meet their targets. The assessment that focuses on poverty reduction impacts is covered in Section 6.

<u>NEA-SEP</u>

For the NEA-SEP, the cost efficiency in terms of distribution lines installed cannot be determined because we were not given data on the length of lines installed per EC or per sitio. The cost efficiency figures in 2011with respect to sitios are an average cost of Php530,809 per sitio and an average cost of Php26,729 per household. Since this is the first time that the SEP is implemented and no other program is implementing it, no benchmarking against past projects is possible. Relative to the DOE-HEP (see average cost for HEP below), the average cost per household under SEP is lower, which proves that on-grid electrification is more cost efficient.

Based on the NEA Roadmap to Electrification 2010-2015, the SEP target for 2011 at the national level is 1,500 sitios. The monitoring reports show that the target of the ECs that were given subsidies is a total of 1,410 sitios (sum of target per EC) and the accomplishment is a total of 1,520 energized sitios. This resulted in the electrification of 30,186 household connections. Based on our examination of the reports, it can be safely concluded that the target was surpassed.

<u>DOE-HEP</u>

In the case of the DOE-HEP, based on the procurement experience of the DOE, the following are the ranges of cost per output by type of PV solar system (in Wp or peak watts, the unit used in describing the capacity of PV systems):

Php11,100 to Php14,500 per 25Wp PV system
Php18,300 to Php20,700 per 50Wp PV system
Php25,400 to Php27,700 per 75Wp PV system

We were unable to determine the average cost per household, average cost per streetlight and average cost per communal system because we were not given sufficient breakdown of the data to determine these indicators. Nevertheless, disregarding the streetlights and

[28] Carin, Barry and David A. Good. 2004. "Evaluating Efficiency and Effectiveness in Public Sector Delivery," Consortium for Economic Policy Research and Advice, http://www.aucc.ca/_pdf/english/programs/cepra/evaluation_paper.pdf, accessed on April 23, 2012.

communal systems for rough estimation purposes, the approximate average cost per household under the HEP is Php35,913 per household.

Relative to the barangay electrification program from 1999-2009, given the obligated amounts from 1999-2009 (see Table 6 below), the average cost per household in the barangay electrification program in 2010 prices (in 2010 prices because the HEP accomplishment in 2011 was contracted in 2010) is Php42,029. Thus, the HEP accomplishment in 2011 also has a lower average cost per household. This, however, could be partly explained by the decreasing trend in PV system prices.

Table 6: Barangay Electrification Program Accomplishments, 1999-2009

Year	Total Allotment Releases (Php)	Total Obligations (Php)	Energized Barangays per year	Energized HHs per year
1999	45,314,000.00	45,250,872.50	1	10
2000	81,659,000.00	81,658,999.00	60	2195
2001	109,538,250.00	109,537,811.55	127	4320
2002	139,430,000.00	138,926,642.81	85	2958
2003	80,049,000.00	80,041,007.20	105	4355
2004	80,017,000.00	78,482,824.29	92	3423
2005	76,672,000.00	71,301,824.50	65	2622
2006	76,672,000.00	75,654,682.82	77	3120
2007	76,672,000.00	72,138,662.51	90	3169
2008	82,322,000.00	82,320,361.72	3	95
2009	98,786,000.00	96,080,737.28	97	4027
Total	**947,131,250.00**	**931,394,426.18**	**802**	**30294**

Source: DOE

Benchmarking against USAID-funded Alliance for Mindanao Off-grid Renewable Energy (AMORE) is undertaken. AMORE is a partnership between the USAID, DOE and private sector partners from the energy industry and it implements a program for off-grid rural electrification program in conflict-affected communities in Mindanao. The program is administered by Winrock International, a US-based non-profit organization with field offices in the Philippines specifically for AMORE. AMORE Phase 2, which was implemented in 2005-2009, was able to energize 10,751 households at a cost of US$10.4 million. Given that the average exchange rate during the period was Php48.93/US$1, the computed cost efficiency indicator for AMORE is an average cost of Php47,333 per household. This average cost is higher than the DOE-HEP average cost and, thus, relative to AMORE, the DOE program is deemed more cost efficient.[29] Nevertheless, considering that AMORE reaches out to conflict-affected communities in Mindanao, it may be the case that it has peculiarities that make program implementation more costly. AMORE Phase 3 is still ongoing.

With respect to achieving the HEP targets, a DOE representative during the May 24 FGD stated that the target of 2,000 households per year was surpassed in 2011. However, since there was no 2010 budget release and the contracts using the 2009 budget were approved only in 2010, the implementation period for the HEP was actually 2010-2011. There is no separate report of 2010 accomplishment. Therefore, the accomplishment of 2,750 households as explained above can be considered as accomplishment for two years and it cannot be strictly said that the target of 2,000 households per year was surpassed in 2011. Nevertheless, it can still be said that the DOE had been faithful to its mandate to provide rural electrification access even if it was not given budget in 2010. For the accomplishments related to streetlights and communal systems, there are no targets against which these can be compared.

The review of the master plan for sitio electrification program and the feasibility of reaching the 90 percent household electrification rate by 2017 are covered in Section 8 of this study.

[29] In its November 21, 2012 comment, the DBM raised that although PIDS finds that the DOE HEP is cost-efficient compared with other electrification programs, the sustainability/maintenance cost was not taken into consideration. We are clarifying that in making this conclusion, we compared the cost of solar technology among the three programs—the HEP, the 1999-2009 barangay electrification program and USAID-AMORE. Thus, it can be safely assumed that once purchased and set up in the off-grid locations, the solar systems will more or less have similar maintenance costs. The maintenance costs could even be higher in the AMORE locations since these are in conflict areas. The DBM comment does not strongly invalidate PIDS' findings.

6 The Impact of Rural Electrification on Poverty

Review of literature on electrification and poverty reduction[30]

Various studies have been conducted in quantifying the impact of rural electrification on the welfare of the poor in developing countries. It is viewed that infrastructure development, in this case electricity, is one key in achieving the aim of sustainable inclusive growth and reduction of poverty (Ali and Pernia, 2003). A report of Silva and Nakata (2009) highlights the high correlation between access to energy and development. Further, even a minimum level of energy consumption per capita tends to place a person above the poverty line (Spreng 2005 as cited by Silva and Nakata 2009).

Thus, it may not be surprising that poor countries view rural electrification as a key to economic progress. For various reasons, electrification is vital to the pursuit of promoting equity and development (ESMAP 2002). For one, it is believed that electrification can fuel growth and development. Areas with electricity are more developed when compared to areas without access to it. Electricity can improve business and productivity in rural areas, provide efficient lighting to families, and could very well improve the quality of life through alleviation of poverty (ESMAP 2002; Bensch, G. et. al. 2010). These justifications also lend credibility to the assumption that electrification contributes to the achievement of the Millennium Development Goals (Bensch, G. et. al. 2010).

Yet in trying to capture and measure the impact of electrification on poverty alleviation, the literature suggests a vast range of factors to be included. The methodologies for measuring the impact also vary considerably. This variety may be attributed to the very notion of poverty in the first place. Through time, the concept of poverty has evolved into a multi-dimensional issue which covers numerous aspects of a person's daily life (Silva and Nakata 2009). Analysis may involve a person's income, education, health and access to basic needs, to name a few. Further, even these factors overlap and may be a cause or an effect at the same time (ESMAP, 2002). As such, the impacts of rural electrification on poverty reduction can be seen in a number of channels.

<u>Channels of Poverty Reduction</u>

In an approach paper on Rural Electrification and Poverty Reduction[31] by the World Bank-Independent Evaluation Group (2008), the identified channels of poverty reduction include (i) income, (ii) health, (iii) education, (iv) women's quality of life, and (v) reducing environmental harm. Another framework that is used to identify the impacts of rural electrification is the Organization for Economic Cooperation and Development-Development Assistance Committee capability framework (i.e. Bliss, 2007). The OECD-DAC framework identifies the following as means to escape or avoid poverty: (i) economic capability to use assets in order to attain and pursue a sustainable livelihood; (ii) human capability (e.g. through health and education); (iii) political

[30] The author is grateful to Keith Detros for contributing this review of literature.

[31] The approach paper took the list from "Energy and Poverty: myths, links and policy issues," Energy Working Notes May 2005, Energy and Mining Sector Board, World Bank.

capability to participate politically; (iv) socio-cultural capability (i.e., capability to be included in social and cultural life; and (v) protective capability to lessen vulnerability and to withstand economic shocks.

The channels of poverty that are identified certainly overlaps with each other. This literature review delves into some of the findings regarding economic activity as a whole, education, health, and fertility reduction as channels of poverty reduction.

Economic Activity

According to Ming (2003), investing in power networks in rural areas has short-term and long-term impacts. The short-term impact is caused by capital injection and the long-term impact is through the use of electricity itself. Furthermore, the rural sectors' enterprises (i.e., agriculture and other businesses) will have economic outputs that would contribute to the per capita income of rural residents. The same study also finds that electrification is accompanied by urbanization and development through agriculture and township industry empowerment.

Ali and Pernia (2003) highlights the increase in economic productivity due to infrastructure development, including rural electrification. In Bangladesh and India, rural electrification contributes to reducing poverty incidence as electrification increases the use of irrigation. In China, electricity also has direct contribution to the nonfarm sector growth. The study suggests that for every 10,000 yuan spent for electricity development, 2.3 persons are brought out of poverty. This is consistent with the findings in the study of Ming (2003) that capital investment in the rural areas of China brought about by electrification is directly correlated with regional economic growth. The Philippines and Indonesia also experienced benefits from rural electrification. Increased employment and incomes of the poor has led to poverty reduction. Yet in the case of the Philippines, the impacts are clearer for the households belonging to the upper quintiles and are quite unclear for the poorest (Balisacan and Pernia 2002 as cited by Ali and Pernia 2003). This suggests that complementary facilities and a certain income level may be needed for the full benefits of electrification to be realized.

A World Bank Independent Evaluation Group study on The Welfare Impact of Rural Electrification (2008) also suggests that the direct beneficiaries of rural electrification are the non-poor. The economic benefit of rural electrification comes from the fact that electricity supply decreases the cost of energy to the user, hence an increase in consumer surplus. This trend, however, favors the well-off families as connection charges are prohibitive to the poor. However, they emphasize that as the grid is extended, the more poor households are included. **Though the pattern of electrification may not target directly the poorest, it becomes more distributed as the coverage is expanded**. The study also suggests that grid extension should be where it would cost least and communities can afford it most. Moreover, the benefits of rural electrification are viewed to be greater when considerable attention is given to ensuring that the extension is given to those least able to connect. This goes together with ensuring that the poor will be able to use electricity efficiently.

A study by Bliss (2007) provides a discussion of the short-term and the medium- to long-term impacts of electrification on the poor. The study finds that electrification could cause a rural household to incur, in the short-term, additional costs and even expand household expenditures. The poorest households may not feel the immediate benefit of rural electrification as they could experience economic financial losses due to investment prices and the bill of electricity consumption. This scenario could lessen their capacity to withstand economic fluctuations. Furthermore, such additional expenditure may directly compete with other needs of the household, including food and shelter.

In the medium-term however, the poorest households would benefit from the general economic development that the area would experience. This would stem from the increase in economic activity due to the increase in electrical power supply. As households with access to electricity are expected to expand their current business or even start a new one, there would be an increase in labor demand and, in turn, employment. Thus, this would generate income for the poor. Most of the existing micro- and small to medium enterprises could derive direct economic profits from the influx of electric power supply. The study conducted by ESMAP (2002) in the Philippines shows that electricity plays a vital role in the development and the profitability of businesses as having electricity connection allows them to operate longer and be more profitable. Human capabilities are also seen to improve due to the enhancement of different or new business activities.

Education

According to the World Bank, investing in human capital, especially in education, would equip people with necessary skills to reduce poverty and eventually compete in the global market. Studies suggest that rural electrification has direct impacts on education (WB-IEG 2008, Bensch, G. et. al. 2010, Bliss 2007, and ESMAP 2002).

The means by which electrification directly affects education are: (i) improvement in the quality of schools, either through the provision of electricity-dependent equipment, or increase in teacher quality and quantity; and (ii) increase and efficiency in time allocation for studying at home (WB-IEG 2008). Electrification enables schools to have better facilities and improve children's learning. It also has a positive impact on the attraction, increase and retention of teachers in rural areas. Yet it must be noted that electricity alone does not solve any other constraints such as lack of textbooks and school furniture.

With respect to time allocation for home study, literature suggests that electricity increases the study time at home of children. Of course, this is directly attributed to the availability of high-quality lighting that makes it possible to study at night. In Rwanda, a study by Bensch, Kluve, and Peters (2010) also details that there is an increase in reading in electrified areas. The ESMAP study also suggests that in the Philippines, a child in an electrified household tends to read or study 48 minutes longer per day than a child in an unelectrified household. Furthermore, children in electrified households are more likely to have higher education levels than those in households without electricity. The difference is almost two years—8.5 versus 6.7 years (ESMAP 2002).

Though rural electrification is also seen to increase human capital through education, Bliss (2007) suggests that holistic education benefits can only be seen in the long term as electricity alone would not address other pressing concerns in education.

Health

Rural electrification has a positive impact on health and poverty alleviation. With respect to health clinics, electrification makes possible: (i) the longer operating hours of clinics, and (ii) having equipment that requires electricity. In Kenya and Bangladesh, rural electrification enabled clinics in rural areas to be open for an average of one hour longer than before electrification.

Electrification also gives rural households the opportunity to replace kerosene lamps with electric ones and this tends to positively affect health in rural areas. This applies not only to lighting but also to cooking. This results in improved indoor quality that helps the household members from contracting diseases such as acute lower respiratory infections and pulmonary tuberculosis, and reduces the incidence of low birth weight and infant mortality (WB-IEG 2008). Better health information is also an impact of rural electrification. Improved health knowledge comes from information made available by radios and television. Finally, nutrition is also improved with access to storage facilities such as refrigeration. In a community, rural electrification could also lower the cost of providing immunization by health clinics as vaccines will experience longer shelf lives.

Fertility Reduction

Aside from impact on human capital development, it is also believed that rural electrification can also have impacts on population growth through the channel of fertility reduction. However, the literature so far yields mixed results in establishing the relationship between fertility rate and rural electrification (ESMAP 2004). In India for example, a study done by Samanta and Sundaram in 1983 shows that there is no relationship between having access to electricity and having a smaller family size. On the other hand, a survey in Bangladesh by Barkat et. al. (2002) shows a strong relationship between electricity and fertility reduction.

In the case of the Philippines, a study conducted by Herrin (1979) suggests that electrification can lead to demographic changes in the area. The study posits that economic development and increased economic activity caused by electrification tends to change investment patterns. The option to invest in other areas such as business enterprises and human capital (e.g. education and health) increases the opportunity costs of having additional children. These additional opportunities for investments and savings have the tendency to decrease the value of children as "traditional investments for old-age security' (Herrin 1979, p.83).

In a more recent examination of the link between fertility reduction and electricity, the ADB Evaluation Group (2010) suggests that in Bhutan, rural electrification tends to reduce fertility rates. This is because more light at night contributes to less reproductive activities as it provides longer waking hours to enable household members to do household chores and income-generating tasks. Consistent with the ADB findings, the WB IEG (2008) also puts forward a causal link on how electricity can impact fertility. According to their earlier study (IEG 2005) in Bangladesh, as electricity becomes available, access to media such as television and radio also becomes available. This increased access to media means increased access to information and development of health awareness. This awareness that is rooted from access to electricity results in behavioral changes that improves health outcomes and leads to fertility reduction.

The impact of rural electrification on poverty in the Philippines

The actual impact of the SEP and HEP on poverty cannot be studied yet given that these programs started only in 2011. Moreover, baseline and monitoring data on the actual beneficiaries of the program are not readily accessible from the implementors. As an alternative, we focused on the impact of Philippine rural electrification in general on poverty using data from the Annual Poverty Indicators Survey (APIS) 2010. We used these official nationwide survey data on poverty indicators and factors influencing poverty to establish the relationship between electricity access in rural areas and poverty reduction.

Nevertheless, if the implementors were to establish an impact study of the SEP and HEP in the future, the following are the prerequisites: (i) identification of the household beneficiaries of the SEP and HEP; (ii) gathering of their poverty-related characteristics *before* they become beneficiaries of the program; and (iii) monitoring and comparison of their poverty-related characteristics *after* they become beneficiaries of the program. An enhanced methodology is to compare the poverty reduction impacts on the household beneficiaries (i.e., the treatment group) with the changes in poverty in a group of households that did not benefit from the SEP and HEP (i.e., the control group). It is also necessary that the gathering and compilation of data on the poverty-related characteristics of the household beneficiaries before and after they become recipients of the program be in standard formats. The standardization should also be incorporated early on in the implementation design of the monitoring and evaluation system.

The analytical framework and methodology

We adopted the analytical framework in the manual *Introduction to Poverty Analysis* by the World Bank Institute (2005) wherein the immediate or "proximate" causes of poverty are examined by analyzing the effects of key determinants on income or spending. The manual suggests the following key causes, or at least correlates, of poverty:

- Regional-level characteristics – Examples include vulnerability to natural calamities, remoteness, quality of governance, and property rights and their enforcement.

- Community-level characteristics – Examples include the availability of physical infrastructure (roads, water, electricity), availability of social services (health, education), proximity to markets, and social relationships.

- Household and individual characteristics – The most important categories are:

  Demographic - household size, age structure, dependency ratio, and gender of head

  Economic - employment status, hours worked, and property owned

  Social - health and nutritional status, education, and shelter.

A direct regression of measurements of these characteristics on per capita income or per capita expenditure is commonly undertaken. In such regression, the dependent variable per capita income or per capita expenditure is a continuous variable. A logit or probit regression, where the dependent variable is a binary variable that is set equal to 1 if the household is poor and to 0 otherwise, can also be undertaken but some researchers do not prefer this because some information (e.g., magnitude of implied relationships) could be lost in applying this. Nevertheless, a logit or probit regression is more appropriate when designing targeted interventions, such as a conditional cash transfer program.

Applying regression techniques on the correlates of poverty is meant to explain the extent to which such factors increase the risk of poverty, but not necessarily causality. For instance, a finding that lack of access to electricity is associated with poverty could mean that the poor are poor because they lack access to electricity, or that the poor lack access to electricity precisely because they are poor and cannot afford it. Nevertheless, these correlates are being called "proximate" causes of poverty since these lead to signs of where further investigation of the deeper causes of poverty would be necessary.

The regression model used in this study is semi-log model where ln(per capita income) and ln(per capita expenditure) were used as dependent variables and were each regressed on the explanatory variables. Appendix 1 explains the semi-log model. Multiplying the coefficient of the explanatory variable yields the percentage change in per capita income or per capita expenditure of the rural household per absolute change in the explanatory variable. STATA is the statistical software used in the regression.

<u>The APIS data</u>

The Annual Poverty Indicator Survey (APIS) gathers information on the socio-economic profiles of families and different indicators related to poverty. Such information include: demographic and economic characteristics; health status and education; awareness and use of family planning methods; access to housing, water, sanitation and electricity; availment of credit to finance the family business or enterprises; ownership of properties; and other indicators of income and expenditures.

Data for a total of 20,103 households are in the APIS 2010 dataset. Fifty-five percent of these households or 10,951 households live in rural areas. The selected indicators used in the regression as well as the descriptive statistics for these are in Table 7 below.

Table 7: Descriptive Statistics of the Data Used in the Regression

Variables	Mean	Standard Deviation	Minimum	Maximum
Per capita income [a]	16,547.95	21,895.68	1,121.20	768,920
Per capita expenditure [b]	14,418.97	16,405.06	1,548.40	535,561
Family size	4.72	2.22	1	15
Sex (Household Head) [c]	0.17	0.38	0	1
Age (Household Head)	50.56	14.08	15	98
Educational Attainment (Household Head)	21.07	12.71	0	75
Ownership of Land [d]	0.36	0.48	0	1
Electricity Connection [e]	0.78	0.41	0	1
Water Access [f]	38.53	2.02	1	5000
Toilet Access [g]	1.87	1.69	1	7

Notes: [a b] in Philippine pesos
[c] has a value of 1 if male and 0 if female
[d] has a value of 1 if owning land and 0 otherwise
[e] has a value of 1 if with electricity connection and 0 otherwise
[f] the magnitude of level of access to water depends on distance from the water source and ranges from 1 meter to 5,000 meters
[g] the magnitude of level of access to toilet facilities depends on the deteriorating level of access and ranges from 1 to 7, where 1 is toilet at home, 2 is shared toilet, 3 is closed pit, 4 is open pit, 5 is drop/overhang, 6 is pail system, and 7 is "none" or open defecation

Most of the APIS household-survey respondents in rural areas have electricity connection, as evidenced by the high mean of 0.7815. Given that the variable electricity is a binary variable, with 0 meaning no electricity connection and 1 meaning with electricity connection, the mean denotes 78.15% of the household-survey respondents in the rural areas have electricity connection.

The results

The expected results are negative coefficient for family size, positive coefficient for sex of the family head, positive coefficient for the age of the family head, positive coefficient for the education level of the family head, positive coefficient for presence of electricity, negative coefficient for poor access to water, and negative coefficient for poor access to toilet facilities. Table 8 and Table 9 below show the regression results. The coefficients have the expected signs and these are statistically significant. Note that the positive sign for electricity means that households are better off when they have electricity connection than otherwise.

Table 8: Regression Results (Per Capita Income Equation)

Variable	Coefficient	t-statistic
Constant	8.936 (0.033)	274.12
Family Size	-0.117 (0.003)	-46.73
Sex (Household Head)	0.035 (0.015)	2.35
Age (Household Head)	0.006 (0.000)	13.98
Educational Attainment (Household Head)	0.023 (0.000)	49.74
Own Land	0.072 (0.011)	6.36
Electricity	0.364 (0.015)	24.50
Water Access	-0.0002 (0.000)	-5.82
Toilet Access	-0.045 (0.004)	-12.55
R-squared	0.4425	
Adj R-squared	0.4421	
Number of observations	10951	

Note from the results above that household access to electricity in rural areas is associated with a 36% increase in per capita income. The positive percentage change in per capita income implies poverty reduction.

Table 9: Regression Results (Per Capita Expenditure Equation)

Variable	Coefficient	t-statistic
Constant	8.999 (0.028)	317.75
Family Size	-0.110 (0.002)	-50.53
Sex (Household Head)	0.039 (0.013)	3.02
Age (Household Head)	0.004 (0.000)	12.12
Educational Attainment (Household Head)	0.019 (0.000)	48.98
Own Land	0.069 (0.010)	6.96
Electricity	0.335 (0.013)	25.98
Water Access	-0.0002 (0.0000)	-6.76
Toilet Access	-0.041 (0.003)	-12.99
R-squared	0.4580	
Adj R-squared	0.4576	
Number of observations	10951	

The results above demonstrate that household access to electricity in rural areas is associated with a 34% increase in per capita spending. The positive percentage change in per capita expenditure implies poverty reduction.

Since there is evidence of a positive relationship between rural electrification and poverty reduction, it makes sense to continue the government's rural electrification programs. This positive relationship could be reinforced by having more targeted programs, that is, with targets based on households rather than locations (e.g., barangays or sitios).

7 Assessment of the Prioritization Criteria for the SEP and HEP

During past discussions with the DBM representatives, they used "standards/criteria for electric cooperatives to effectively implement SEP and HEP" (the phrase used in the TOR) in the same sense as they would use prioritization criteria. Moreover, the criteria used by the NEA and the DOE are for determining whether electric cooperatives (ECs) could qualify and be prioritized under the rural electrification programs. Thus, we focused on the prioritization criteria.

Prioritization criteria for the SEP

In the first place, all the sitios that are not yet energized are considered eligible under the program. So the first criterion is lack of electricity in the sitio. Thus, all ECs that have unenergized sitios are deemed qualified to participate in the program. Based on the summary of the annual targets of NEA, the coverage is a total of 32,441 sitios (Table 2 in Section 2).

From this set of eligible sitios and eligible ECs, NEA applies the following prioritization criteria:

1. **Tapping point** - Proximity of the sitio for consideration to the last connected electric pole, or the tapping point, is the paramount criterion. It is also assumed that all the barangays within the franchise area of the EC has been energized prior to sitio energization.[32] In the case of energized barangays using solar energy that are to be connected to the grid, sitios that are not in these vicinities will be prioritized due to engineering considerations.

2. **Right of way** - Areas where legal concerns and consumer-related concerns on the right of way that have been dealt with will be prioritized.

3. **Peace and order condition** - To ensure the completion of the specific energization project (conducted through progress billing to contractors) and the safety of the construction crew, there should exist a generally known atmosphere that is conducive to peace and order.

4. **Construction cost** - Most cost-effective sites (i.e., entailing the least cost) will be prioritized. For purposes of rapidly estimating ballpark figures, the approximate construction cost is placed at Php1 million per sitio. Price indices, including contingency costs, will be updated periodically.

5. **EC relationship with NEA and other pertinent agencies** - Subject to NEA's evaluation, ECs with no adverse Commission on Audit (COA) findings, with harmonious internal relationships between management/workforce and the ECs' board of directors, and with positive social feedback will be prioritized.

No weighting system is applied but the extent to which the criteria are satisfied affects the timing of implementation of the projects. For example, ECs with unsettled right-of-way problems and with adverse COA findings will have to give way to other readily implementable projects.

[32] But an energized barangay does not mean that all sitios in that barangay are energized. It only means that at least 20 households in that barangay had been given electricity connection.

Prioritization criteria for the HEP

Under the HEP, the targets are also based on unenergized sitios. It may be recalled from Section 2 that the DOE target during this administration is to energize at least 2,000 households every year using appropriated funds. The aim is to contribute, together with other programs, toward achieving 90 percent household electrification rate nationwide by 2017.

Although the target is a specific number of households, these households are those that are in unenergized sitios and such unenergized sitios are not covered by any grid extension plan (i.e., not covered by the EC's extension plan using their own funds, national government subsidy via the SEP, or co-funding with private companies).

Table 10: Prioritization criteria of the DOE for the HEP

Criteria	Scoring system	
	Original Score	Re-calibration of score
(a) The target sitio is duly certified by the concerned EC as unenergized and the EC has no grid extension plan for it within the next five years	40%	
Re-calibration of score using distance of the sitio from the last tapping point:		
greater than 5 km		40%
between 5 km and 2 km		30%
less than 2 km		20%
(b) Social acceptability of PV-SHS	20%	
(c) Willingness to provide counterpart funding (initial Php1000 and monthly fee of Php150 to Php250)	20%	
(d) Accessibility of the sitio	20%	
Re-calibration of score; if the sitio is accessible by:		
four-wheel drive vehicle		20%
boat or jabal-jabal		15%
hiking		10%
Total [a + b + c + d]	**100%**	

Assessment of the prioritization criteria

The SEP prioritization criteria basically employ a "least cost" approach. The least cost construction cost is a measure directly applying this approach and the proximity to the tapping point is another measure that aims to minimize cost. Connecting to the nearest tapping point naturally follows from the least cost decision rule. The remaining criteria (i.e., clear right of way, peace and order, and well-managed EC) are prerequisites to orderly implementation and can have equal treatment. The measures of least cost, on the other hand, can allow some ranking of sitio beneficiaries.

The least cost approach has the advantage of ensuring the financial sustainability of the program as it allows a higher connection rate per peso investment (e.g., a Php1 million investment in a community near the grid that can connect 100 households allows a higher connection rate per peso investment than a Php1 million investment in a far-flung community that can connect only 50 households due to the high cost of having longer distribution lines). It also enables the ECs to minimize the operation and maintenance cost given that the distribution line will connect to the nearest tapping point.

However, the least cost approach has the disadvantage of favoring the better-off communities. The households that are in a cluster near the tapping point, which are usually near the centers of economic activities, are usually less poor than those who live very far from the tapping point.

The HEP criteria, on the other hand, employ a "highest benefit" approach and the benefit is in terms of avoided cost. The HEP involves off-grid electrification and the scoring system favors the farthest community. The farther the cluster of households are from the grid, the more expensive it is to connect them to the grid, or the higher the avoided cost of connecting them to the grid if they will be prioritized in off-grid electrification using solar technology or a hybrid of solar and diesel technology.

Having measurable prioritization criteria in the SEP and the HEP is advantageous as it minimizes political interference in the allocation of resources. When the decision rule is based on an objective and measurable indicator, it is less prone to disputation and manipulation.

But there is still room for improvement in the prioritization criteria. For example, the social criteria design can include not only the presence of at least 20 potential household connections in a sitio but also the presence of local enterprises that can raise economic activities and employment (e.g., livestock production, agricultural processing and merchandising micro-enterprises).

Moreover, since the connection fee still acts as a barrier for some households, as described during the focus group discussion, it can be added in the SEP criteria the demonstration that an EC has an affordable amortization package for the initial connection fees of households. In the HEP, on the other hand, the community associations participating in the program must also demonstrate, aside from proofs of social acceptability, that there is an affordable amortization package for households. Should there be verification issues with respect to the reported affordable amortization schemes by the ECs/community associations, program managers could verify the affordability by comparing these with the current connection fees in the area and the latest poverty threshold estimates.[33] (The latest figures of the poverty threshold estimates are in the 2009 Family Income and Expenditure Survey).

A suggestion that takes inspiration from the theory of a price discriminating monopolist in order to maximize profits may also be explored. A price discriminating monopolist charges a higher price to those who have a lower elasticity of demand. In the case at hand, the goal is to maximize social

---

[33] An illustration of estimating affordability using poverty thresholds is provided through the estimation of a lifeline tariff for potable water supply in Navarro, A. (2010), *Rationalization of Public Resource utilization for the Water Supply and Sanitation Sector: A Concept Paper* (unpublished; available at the USAID-Philippine Water Revolving Fund Follow-On Program or through the author).

benefits. An electric cooperative, a not-for-profit entity that is supposed to be an agent of the government for maximizing social benefits, can discriminate in giving amortization schemes for the connection fees. It can extend no or very short amortization periods for those households that have a lower elasticity of demand, that is, households whose willingness to pay for the connection fee is not very responsive to the price of it. For the households with high elasticities of demand, that is, those which have lower willingness-to-pay thresholds or which cannot afford the regular payment schemes for connection fees, it can extend longer amortization periods.

8 Assessment of the Sitio Electrification Master Plan and Budget Forecast

The Sitio Electrification Master Plan 2020 prepared by the NEA[34] provides information on the following: the number of unenergized sitios per EC, how many of these are to be financed by the SEP subsidies, the number of potential connections for the SEP-targeted sitios, the estimated project cost or subsidy requirement, and the number of sitios to be connected using other sources of funds. The information also include the tapping point, accessibility, location identifiers (sitio/purok, barangay, municipality/city, and congressional district), kilometers of distribution line to be set up, and the power source.[35] Appendix 2 provides a summary of the Sitio Electrification Master Plan 2020.

In the master plan, 31,708 sitios are to be covered by the SEP subsidies and 1,262 are to be covered by other funding sources (e.g., EC's internally generated funds and legislators' PDAF). Thus, the total target of the master plan is 32,970 unelectrified sitios.

In terms of regional prioritization, the SEP allocates large funds where the need is highest. Electrification is needed the most in Mindanao, where 45% of the target sitios are located. Twenty-eight percent of the targets are in Luzon and 26% are in Visayas. Region 12 (SOCCSKSARGEN ECs will host the most number of sitios (a total of 4,010 sitios) to be energized.

The TOR prepared by the DBM for this study requires a review of the master plan up to its 100% completion beyond 2017. Note that the master plan was prepared with year 2020 as the target completion year. Recall also that in response to the current administration's thrust of accelerating the achievement of targets, NEA worked on the same national target of more than 32,000 sitios[36] and planned for 100% electrification of these sitios by 2015 (i.e., the NEA Roadmap to Electrification 2010-2015). Thus, the 100% completion by year 2017 in the TOR is a misspecification and we, thus, review the targeting schedule of up to 100% completion by year 2015.

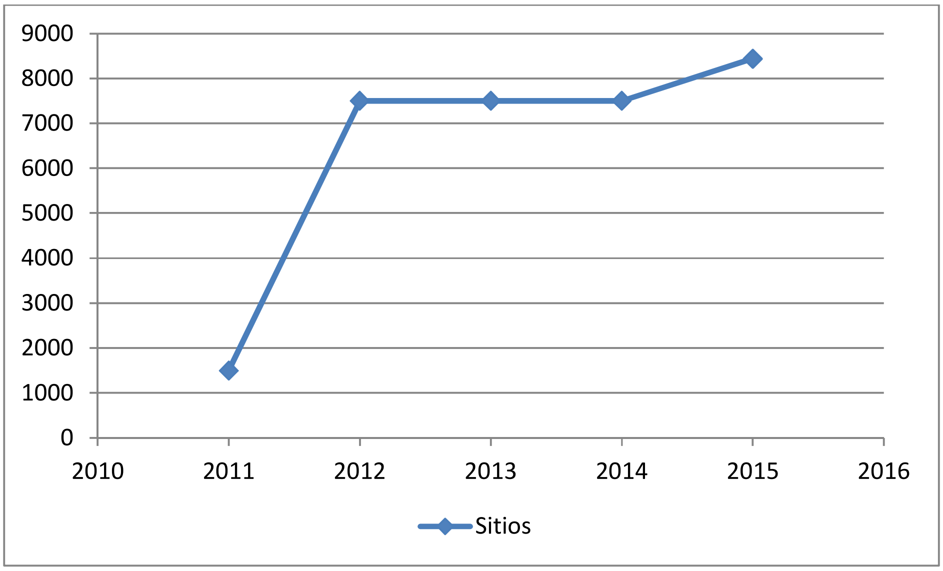
[34] The version shared by NEA is the Sitio Electrification Master Plan 2020 - March 21, 2010 update.

[35] The master plan has no narrative and instead consists of tabulated information per EC on the mentioned categories.

[36] The fact that the figures in the Sitio Electrification Master Plan and the total target in the NEA Roadmap 2010-2015 do not tally (32,970 in the master plan vs. 32,441 in the roadmap) may be explained by the difference in the timing of updating and the fact that there is no official database of sitios from statistical agencies. Every call for submission of sitios by the NEA results in a new updated number of total sitios.

The accelerated implementation of sitio electrification up to 2015 involves a sudden jump in the electrification target starting in 2012—from 1,500 sitios in 2011 to 7,500 sitios in 2012. The same level of target (i.e., 7,500 sitios) will be maintained up to 2014 and then 8,441 sitios will be targeted in 2015 (see Figure 7). This sudden jump in physical targets also means a sudden increase in subsidy allocation and policymakers should consider whether the NEA and the ECs have the capacity to absorb and mobilize funds quickly in order to fast track project implementation.

Figure 7: Accelerated Targeting of Sitios to be Electrified



Based on recent status reports on sitio electrification accomplishment, it seems that NEA and the ECs are having a problem with their absorptive capacity. NEA reports in its status of energization tables as of December 31, 2011 that a total of 79,279 sitios were already energized; and in the status tables as of October 31, 2012 (latest available), it reports that a total of 83,792 were energized. Therefore, a total of 4,513 sitios were energized from January to October 2012. Given that the target under the accelerated implementation program is 7,500 sitios in 2012 and there were only two months remaining for 2012 when the latest status report was generated, this means that NEA and the ECs must have energized at a rate of 2,987 sitios per month if the 2012 target was met. (The final figure for 2012 accomplishment is not yet released.) However, based on recent history, NEA and the ECs cannot mobilize the subsidies too fast in order to energize in one month about 66% of what was energized in the past 10 months (i.e., 2,987 sitios per month in November-December as against 4,513 sitios from January-October 2012). Thus, it is likely that the 2012 target of 7,500 sitios was not met. This means that the SEP targeting design is overstretching the absorptive capacity of the NEA and ECs.

Decision-makers must also note that targeting beyond the absorptive capacity of agencies should also entail innovative interventions and mechanisms to address the sudden increase in the number of procurement activities, as well as monitoring and evaluation tasks. Believing that oversight is seriously weakened, corrupt implementors might take advantage of such situation as an opportunity to cheat. The 2012 implementation experience shows that corruption in the field is indeed happening, as evidenced by the case of the Zamboanga City Electric Cooperative (ZAMCELCO) wherein some officials are now facing charges for the following alleged anomalies in the SEP implementation in the ZAMCELCO service area: (i) six sitios were reported newly constructed and completed but these sitios remain unenergized; (ii) 51 units of fabricated concrete poles and 59 units of fabricated steel poles were found to be not within NEA standard specifications; and (iii) 260 units of steel poles were lent to the contractor by the cooperative.[37]

In its November 23, 2012 comments, the DOE also raised the accuracy of the target 100% sitio electrification by 2015 and asked how the NEA plans to address the needs of the sitios which **cannot be physically reached by distribution lines**. The DOE then recommended that off-grid sitios be included in the ECs' franchise coverage areas and let the DOE-HEP energize said sitios using renewable energy systems or any appropriate technology. We believe that this concern by the DOE can be addressed through closer coordination and complementation efforts by the DOE and NEA.

There are many occurrences of missing data on costs and number of potential connections in the master plan. (See the items labelled "no entries" in the summary in Appendix 2.)Nevertheless, based on the meager data on financial costs in the master plan, the range of cost per sitio is between Php0.91 million and Php1.27 million and the average cost per sitio is Php1.14 million. Using the average cost, a rough estimation of the annual fund requirement for the accelerated implementation is as follows:

[37] "Castro, 4 other Zamcelco officials face raps over sitio electrification controversy." 07 January 2013. http://www.zamboangatoday.ph/index.php/top-stories/12770-castro-4-other-zamcelco-officials-face-raps-over-sitio-electrification-controversy.html

Table 11: Estimate of the Annual Cost of the Accelerated Implementation of SEP

	Target number of sitios	**Estimated cost (Php million)**
2012	7,500	8,550
2013	7,500	8,550
2014	7,500	8,550
2015	8,441	9,623
Total	**30,941**	**35,273**

It should be carefully noted that this is a rough estimation and adjustments may have to be considered as the lessons from program implementation arise. Moreover, decision-makers may have to re-assess the absorptive capacity of the ECs and NEA in light of the experience in accelerated implementation in 2012 and explore a possible downscaling of annual targets to more realistic levels and extension of the implementation period to a more realistic duration.

9 Summary of Recommendations

The targeting system for the HEP is household-based whereas for the SEP, it is primarily sitio-based. We are therefore recommending that targeting for the SEP be based on household connections rather than sitios. The sitios currently identified as unserved sitios can be used as location identifiers for the household connections being targeted. The SEP may be continued under the same name (i.e., "sitio electrification") but with the requirement that the establishment of targets be based primarily on households.

We are also recommending that monitoring of accomplishments be on a household level for both the HEP and the SEP. It has been raised by both DOE and NEA that this would be difficult to do given that data being generated by all service providers are based on number of household connections and not households. (The term "household connection" means electricity connection to a housing unit regardless of the number of households actually dwelling in that unit.) We therefore recommend that monitoring and reporting of both indicators, household connections and households served, be undertaken. Since field personnel are already filing reports on household connections anyway and social preparation and community organizing are always a component of project implementation, an additional question on households served per dwelling unit connected may be included in the field reports.

Moreover, we are recommending that the social preparation and community organizing component in the institutional arrangement for the SEP be strengthened in order to: (i) identify what specifically constrains the households from connecting despite the presence of subsidies; and (ii) formulate innovative and community-supported solutions to these constraints. For example, program implementors can try to find out the answers to these questions: Do the households find the Php2,500 subsidy insufficient to cover the total cost of meters and long wiring from the electric pole to their houses? If so, are there viable amortization schemes, or innovative financing schemes for this? Are there possible micro-lending or subsidy sources? If there are already amortization schemes being implemented by electric cooperatives, can these be made more affordable? A more robust social preparation activity coupled with innovative financing schemes supported by the community (or cluster of targeted households) can help analyze and address this "willingness to connect" issue.

Coordination by an overall program team for all the electrification efforts in the country is currently lacking. Moreover, the Expanded Rural Electrification Team that was set up in 2003 and re-constituted in 2006 is inactive. We therefore recommend that the ER Team be re-activated, its setup be streamlined and responsibilities be assigned to positions in offices rather than specific persons.

Since there is evidence of a positive relationship between rural electrification and poverty reduction, we also recommend that the government's SEP and HEP be continued. We also believe that this positive relationship could be reinforced by having more targeted programs, that is, with targets based on households rather than locations (e.g., barangays or sitios).

We also recommend improvements in the prioritization criteria. For example, the social criteria design of the SEP can include not only the presence of at least 20 potential household connections in a sitio but also the presence of local enterprises that can raise economic activities and employment (e.g., livestock production, agricultural processing and merchandising micro-enterprises). Moreover, since the connection fee still acts as a barrier for some households, the SEP criteria may include a demonstration that an EC has an affordable amortization package for the initial connection fees of households. In the HEP, on the other hand, the community associations participating in the program must also demonstrate, aside from proofs of social acceptability, that there is an affordable amortization package for households. Should there be verification issues with respect to the reported affordable amortization schemes by the ECs/community associations, program managers could verify the affordability by comparing these with the current connection fees in the area and the latest poverty threshold estimates.[38] (The latest figures of the poverty threshold estimates are in the 2009 Family Income and Expenditure Survey). Addressing the willingness-to-connect issue is crucial since it prevents the poor from switching to a cheaper and more efficient source of lighting needs, despite being in a sitio or barangay that is already connected to the grid or that is already served by renewable energy systems.

The 2012 experience in the accelerated implementation of the SEP raises red flags on the absorptive capacity of the NEA and the ECs. Therefore, decision-makers may have to re-assess the absorptive capacity of the ECs and NEA in light of this experience and explore a possible downscaling of annual targets to more realistic levels and extension of the implementation period to a more realistic duration.

[38] An illustration of estimating affordability using poverty thresholds is provided through the estimation of a lifeline tariff for potable water supply in Navarro, Adoracion M. (2010), *Rationalization of Public Resource utilization for the Water Supply and Sanitation Sector: A Concept Paper* (unpublished; available at the USAID-Philippine Water Revolving Fund Follow-On Program or through the author).

Appendixes

Appendix 1 - Regression Using the Semi-Logarithmic Model

In the semi-logarithmic model, the slope coefficient measures the relative change in Y for a given absolute change in the explanatory variable.

In the standard $lnY = \alpha + \beta X + \varepsilon$ semi-log equation, when we evaluate the coefficient using calculus, we can show that:

$$\beta = \frac{\partial lnY}{\partial X}$$

$$= \left(\frac{1}{Y}\right)\left(\frac{\partial Y}{\partial X}\right)$$

$$= \frac{\frac{\partial Y}{Y}}{\partial X}$$

$$= \frac{\text{relative change in } Y}{\text{absolute change in } X}$$

If we multiply the relative change in Y by 100, we get the percentage change or growth rate in Y per absolute change in X.

Appendix 2 - Summary of the Sitio Electrification Master Plan 2020

Proposed Sitios for Energization (using national government subsidies)

REGION	PROVINCE	ELECTRIC COOPER-ATIVE	NO. OF SITIOS, USING SUBSIDY	POTENTIAL CONNECTIONS	PROJECT COST	NO. OF SITIOS, USING OTHER SOURCES OF FUNDS
I	Ilocos Norte	INEC	28	301	35,536,852	192
	Ilocos Sur	ISECO	88	.	.	5
	La Union	LUELCO	57	.	.	30
	Pangasinan	CENPELCO	72	.	.	74
		PANELCO I	147	no entry	no entry	-
		PANELCO III	13	no entry	no entry	-
		Subtotal	405	.	.	301
II	Batanes	BATANELCO	13	.	.	-
	Cagayan	CAGELCO I	50	.	.	-
		CAGELCO II	503	.	.	-
	Isabela	ISELCO I	157	.	.	3
		ISELCO II	179	no entry	no entry	-
	Nueva Vizcaya	NUVELCO	no entry	no entry	no entry	-
	Quirino	QUIRELCO	no entry	no entry	no entry	-
		Subtotal	902	.	.	3
III	Aurora	AURELCO	204	.	.	-
	Nueva Ecija	NEECO I	24	.	.	-
		NEECO II - Area I	92	.	.	-
		NEECO II - Area II	40	.	.	9
		SAJELCO	no entry	no entry	no entry	-
	Pampanga	PELCO I	18	.	.	7
		PELCO II	no entry	no entry	no entry	-
		PELCO III	no entry	no entry	no entry	-
		PRESCO	9	no entry	no entry	-
	Bataan Peninsula	PENELCO	no entry	no entry	no entry	-
	Tarlac	TARELCO I	68	.	.	69
		TARELCO II	9	no entry	no entry	-
	Zambales	ZAMECO I	72	.	.	-

REGION	PROVINCE	ELECTRIC COOPER-ATIVE	NO. OF SITIOS, USING SUBSIDY	POTENTIAL CONNECTIONS	PROJECT COST	NO. OF SITIOS, USING OTHER SOURCES OF FUNDS
		ZAMECO II	164	no entry	no entry	-
		Subtotal	700	.	.	85
CAR	Abra	ABRECO	33	no entry	no entry	-
		BENECO	602	no entry	no entry	-
	Ifugao	IFELCO	838	.	.	-
	Kalinga Apayao	KAELCO	250	.	.	-
	Mt. Province	MOPRECO	90	.	.	-
		Subtotal	1,813	.	.	0
IV-A	Batangas	BATELEC I	34	no entry	no entry	7
		BATELEC II	18	.	.	92
	Laguna	FLECO	141	.	.	5
	Quezon	QUEZELCO I	309	no entry	no entry	13
		QUEZELCO II	24	.	.	11
		Subtotal	526	.	.	128
IV-B	Busuanga Is.	BISELCO	18	.	.	1
	Lubang Is.	LUBELCO	3	no entry	no entry	7
	Marinduque	MARELCO	116	.	.	-
	Occ. Mindoro	OMECO	512	.	.	16
	Or. Mindoro	ORMECO	656	.	.	36
	Palawan	PALECO	no entry	no entry	no entry	-
	Romblon	ROMELCO	127	no entry	no entry	-
	Tablas Is.	TIELCO	187	.	.	-
		Subtotal	1,619	.	.	60
V	Albay	ALECO	165	.	.	-
	Camarines Norte	CANORECO	224	.	.	-
	Camarines Sur	CASURECO I	339	.	.	42
		CASURECO II	131	.	.	23
		CASURECO III	7	.	.	81
		CASURECO IV	460	.	.	-
	Catanduanes	FICELCO	13	no entry	no entry	-
	Masbate	MASELCO	37	.	.	-
	Sorsogon	SORECO I	1,061	.	.	-

REGION	PROVINCE	ELECTRIC COOPER-ATIVE	NO. OF SITIOS, USING SUBSIDY	POTENTIAL CONNECTIONS	PROJECT COST	NO. OF SITIOS, USING OTHER SOURCES OF FUNDS
		SORECO II	224	no entry	no entry	-
	Ticao Is.	TISELCO	1	50	1,081,917	-
		Subtotal	2,662	.	.	146
		SUBTOTAL LUZON	8,627	.	.	723
VI	Aklan	AKELCO	79	.	.	2
	Antique	ANTECO	430	.	.	-
	Capiz	CAPELCO	194	no entry	no entry	-
	Iloilo	ILECO I	427	no entry	no entry	-
		ILECO II	311	.	.	-
		ILECO III	169	.	.	-
	Negros Occ.	NOCECO	980	no entry	no entry	-
		VRESCO	832	.	.	90
		CENECO	53	no entry	no entry	-
	Guimaras	GUIMELC O	309	no entry	no entry	2
		Subtotal	3,784	.	.	94
VII	Bantayan Is.	BANELCO	61	.	.	-
	Bohol	BOHECO I	no entry	no entry	no entry	-
		BOHECO II	359	.	.	5
	Cebu	CEBECO I	714	.	.	4
		CEBECO II	375	.	.	70
		CEBECO III	133	.	.	49
		CELCO	114	.	.	-
	Negros Or.	NORECO I	175	.	.	53
		NORECO II	514	no entry	no entry	-
	Siquijor	PROSIELC O	57	.	.	-
		Subtotal	2,502	.	.	181
VIII	Biliran	BILECO	51	.	.	11
	Leyte	LEYECO I / DORELCO	291	.	.	-
		LEYECO II	138	no entry	no entry	1
		LEYECO III	95	no entry	no entry	4
		LEYECO IV	68	.	.	-
		LEYECO V	441	.	.	38

REGION	PROVINCE	ELECTRIC COOPER-ATIVE	NO. OF SITIOS, USING SUBSIDY	POTENTIAL CONNECTIONS	PROJECT COST	NO. OF SITIOS, USING OTHER SOURCES OF FUNDS
		SOLECO	168	.	.	-
	Samar	ESAMELCO	49	.	.	-
		NORSAMELCO	298	no netry	no entry	-
		SAMELCO I	36	.	.	-
		SAMELCO II	394	.	.	-
		Subtotal	2,029	.	.	54
		SUBTOTAL VISAYAS	8,315	.	.	329
IX	Zambo. City	ZAMCELCO	186	.	.	17
	Zambo. Norte	ZANECO	902	.	.	1
	Zambo. Sur	ZAMSURECO I	836	.	.	-
		ZAMSURECO II	1,119	.	.	-
		Subtotal	3,043	.	.	18
X	Camiguin Is.	CAMELCO	172	.	.	3
	Bukidnon	BUSECO	367	.	.	7
		FIBECO	698	.	.	98
	Lanao Norte	LANECO	396	.	.	1
	Misamis Occ.	MOELCI I	149	.	.	2
		MOELCI II	94	.	.	-
	Misamis Or.	MORESCO I	149	.	.	-
		MORESCO II	681	.	.	10
		Subtotal	2,706	.	.	121
XI	Davao Norte	DANECO	1,076	.	.	-
	Davao Sur	DASURECO	1,384	.	.	-
	Davao Or.	DORECO	527	.	.	-
		Subtotal	2,987	.	.	0
XII	Cotabato	COTELCO	2,386	.	.	11
	S. Cotabato	SOCOTECO I	633	.	.	32
		SOCOTECO II	904	.	.	-
	Sultan Kudarat	SUKELCO	40	.	.	-

REGION	PROVINCE	ELECTRIC COOPER-ATIVE	NO. OF SITIOS, USING SUBSIDY	POTENTIAL CONNECTIONS	PROJECT COST	NO. OF SITIOS, USING OTHER SOURCES OF FUNDS
		Subtotal	3,963	.	.	43
ARMM	Basilan	BASELCO	59	.	.	-
	Cagayan de Sulu	CASELCO	no entry	no entry	no entry	-
	Sulu	SULECO	3	397	3,077,584	-
	Siasi	SIASELCO	30	.	.	-
	Tawi Tawi	TAWELCO	59	no entry	no entry	-
	Maguindana o	MAGELCO	649	.	.	-
		Subtotal	800	.	.	0
CARAG A	Agusan Norte	ANECO	208	.	.	27
	Agusan Sur	ASELCO	574	.	.	-
	Dinagat Is.	DIELCO	39	.	.	1
	Siargao Is.	SIARELCO	59	.	.	-
	Surigao Norte	SURNECO	14	460	12,742,316	-
	Surigao Sur	SURSECO I	269	.	.	-
		SURSECO II	104	.	.	-
		Subtotal	1,267	.	.	28
		MINDANAO	14,766	.	.	210
		GRAND TOTAL	**31,708**	**.**	**.**	**1,262**

Note: The entries marked with "." (a dot) under the columns "Potential Connections" and "Project Cost" means that there are incomplete entries in the master plan database. Thus, summing the potential connections or the project cost for all sitios in an electric cooperative is not possible.

References

Ali, I. and Pernia, E. M. 2003. Infrastructure and Poverty Reduction. Economic and Research Department Policy Brief 13. Asian Development Bank.

Asian Development Bank. 2010. Asian Development Bank's Assistance for Rural Electrification in Bhutan—Does Electrification Improve the Quality of Rural Life? ADB Independent Evaluation Department, IES: BHU 2010-27.

Bensch, G., Kluve, J., and Peters, J. 2010. Rural Electrification in Rwanda – An Impact Assessment Using Matching Techniques. RUHR Economic Papers #231.

Bliss, F. 2007. Financial Cooperation with Cambodia: Rural Electrification II – Poverty Impact Assessment. KfW / Bliss & Gaesing Assoziierte Gutachter.

Herrin, A. 1979. Rural Electrification and Fertility Change in the Southern Philippines. *Population and Development Review* 5(1): 61-86.

Ming, Y. 2003. China's rural electrification and poverty reduction. *Energy Policy* 31: 283–295.

Roxas, F. and Santiago, A. 2010. A New Systems Paradigm for the Rural Electrification Program, Philippines. A paper presented to the 2010 Montreal World Energy Council.

Silva, D. and Nakata, T. 2009. Multi-objective assessment of rural electrification in remote areas with poverty considerations. *Energy Policy* 37: 3096-3108.

UNDP/World Bank Energy Sector Management Assistance Programme (ESMAP). 2002. Rural Electrification and Development in the Philippines: Measuring the Social and Economic Benefits. International Bank for Reconstruction and Development-World Bank.

World Bank Independent Evaluation Group. 2008. The Welfare Impact of Rural Electrification: A Reassessment of the Costs and Benefits, An IEG Impact Evaluation. International Bank for Reconstruction and Development-World Bank.

World Bank Institute. 2005. *Introduction to Poverty Analysis*. Washington, D.C.: World Bank Institute.

Philippine Institute for
Development Studies
*Surian sa mga Pag-aaral
Pangkaunlaran ng Pilipinas*

Tel: (632) 892-4059
Fax: (632) 893-9589
NEDA sa Makati Building, 106
Amorsolo Street
Legaspi Village, 1229 Makati City
Philippines
http://www.pids.gov.ph