



**3rd International Conference
on Public Policy (ICPP3)
June 28-30, 2017 – Singapore**

Panel T17cP20 Session 2

Discourses and policy networks, communities and assessment of energy decentralization

Title of the paper

AFFILIATED RENEWABLE ENERGY CENTER: A PARTNERSHIP TOWARDS CLIMATE CHANGE
MITIGATION, ADAPTATION AND UNIVERSITY CAPACITY BUILDING

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Date of presentation

June 30, 2017, 10:30 am-12:30 pm

AFFILIATED RENEWABLE ENERGY CENTER: A PARTNERSHIP TOWARDS CLIMATE CHANGE MITIGATION, ADAPTATION AND UNIVERSITY CAPACITY BUILDING

Presented at *Energy Decentralization* panel, International Conference on Public Policy, National University of Singapore, 30 June 2017

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Abstract: Current government policy on climate change assigns a role on higher education institutions (HEIs) in educating and capacitating people in developing climate change adaptation and mitigation strategies. More than 21 HEIs, including state universities and colleges, have entered into partnership with the Department of Energy to promote the use of renewable energy through the establishment of affiliated non-conventional or renewable energy centers. The study adds to the empirical literature by assessing the accomplishments of selected SUCs in the development and utilization of renewable energy-based technology and in promoting their use at the community and household levels. The paper seeks to answer the question: to what extent and in what ways have the partnerships contributed to the national efforts of promoting the use of renewable energy? Beyond the partnership, how have HEIs utilized the partnership to enhance their teaching, research and extension functions? Initial results of profiling 21 partnerships and two case studies show that HEIs have developed their respective expertise in renewable energy teaching and research and were highly responsive to putting in their contributions toward building a citizenry more informed of the challenges and issues of climate change through the offering of degree programs, research and extension services.

Keywords: renewable energy, affiliated renewable energy center, higher education, Philippines

I INTRODUCTION

The paper presents an analysis of higher education institutions (HEIs)-Department of Energy (DOE) partnerships through the establishment of Affiliated Non-Conventional Energy Centers (ANECs) as an important avenue in addressing climate change issues through the promotion of the development and use of renewable energy. HEIs essentially perform the functions of instruction, research and capacity building. The DOE tapped the expertise of HEIs in the effort to achieve the electrification of all barangays and households and partnered with at least twenty-one (21) HEIs nationwide for the latter to establish ANECs, later renamed to Affiliated Non-Conventional Energy Centers (ARECS). By design, the ARECS, are considered by the Department of Energy as their extension arm in the regions, expected to carry out

barangay (or village) and household electrification programs. Along the way, some of the HEIs have developed, alongside the ARECs, Climate Change Centers enabling them to develop a niche not only in renewable energy development, but also in areas related to climate change and disaster risk management.

A higher education institution is an institution of higher learning. The Philippines has at least 2,374 tertiary education institutions, of which 675 are owned and operated by the government (Cuaresma 2017:73). The Department of Energy is the government agency, among other agencies, mandated to implement the Renewable Energy Act of 2008. This research aims to examine the achievement of HEIs as partners of the DOE in encouraging and accelerating the exploration, development and utilization of renewable energy resources. Specifically, it looks into the programs and projects HEIs have pursued under the DOE-ANEC partnership. A profile of 21 DOE-HEI-ANEC partnerships is rendered to determine the extent of accomplishments supplemented by initial case briefs of three (3) HEIs as a follow through on their accomplishments. Desk research on the 21 ANECs was conducted, as well as interviews and discussions with resource persons from the Department of Energy, Western Palawan State University, Cavite State University, and Central Bicol State University of Agriculture. The accomplishments of the HEIs are initially measured using a simple rating system in terms of whether or not they have accomplished the objectives of the partnership, i.e., whether or not they offer degree programs on or related to climate change, whether or not they conduct and publish climate change research, whether or not they offer or conduct on a regular basis capacity building on climate change, and how else have they articulated their role in responding to the issues of climate change. The HEIs' articulation of roles will be indicated by the presence of absence of programs and activities that directly pursue the promotion of renewable energy development and utilization, and climate change-related concerns.

The study is a work in progress. It gives a profile of the 21 HEI-ARECs and case briefs on two HEIs. The paper proceeds in part 2 with a review of government policy and some literature on the role of higher education institutions in addressing climate change. Part 3 delivers the initial and major findings and conclusions of the study, followed by an integration, lessons learned and recommendations for policy and further research. The paper will not discuss in detail the accomplishments of HEIs on research, extension and training on Renewable Energy. Suffice it to say that there is much accomplishments and much data to substantiate HEI accomplishments in the area of research, extension and training on renewable energy. An expanded study on the HEI-ARECs will be done in a follow-up paper.

II RELEVANT POLICY AND PARTNERSHIP PROVISIONS

Policy Mandate of Higher Education Institutions in Climate Change

The management and operation of an affiliated renewable energy center (AREC, formerly Affiliated Non-Conventional Energy Center or ANEC) is founded on Republic Act No. 9513, otherwise known as the Renewable Energy Act of 2008. RA 9513 provides that the State shall “encourage and accelerate the exploration, development and increase the utilization of renewable energy resources such as biomass, solar, wind, hydropower, geothermal, and ocean energy sources”, among other renewable energy resources and their hybrid systems. The full implementation of RA 9513-backed National Renewable Energy Program was targeted for 2012 and to achieve a 200% increased in RE-based capacity within the next 20 years (2011-2030) with definite capacity targets for wind, hydro, ocean, solar and geothermal energy (Cerezo 2016:3-4). The role of higher education institutions in implementing the provisions of RA 9513 can only be assumed. In a related policy, RA No. 9367 or the Biofuels Act of 2006, the involvement of the academe was indirect and only through the DOST-Philippine Council for Industry and Energy Research and Development (PCIERD).

Policy articulation on the role of the academe in monitoring and implementing programs on climate change, with the implication of unclear budgetary support has been assessed as indirect, if not inconsistent (Cuaresma, 2017:78-79),. In RA 8749, the academe was called upon in 1999 to participate in the formulation and implementation of the Framework and Action Plan on Air Quality. Under RA 9729, the basic education sector through the Department of Education, but not the higher education sector, was called upon in 2009 to climate change in school curricula; the academe was called to have a representative in the Climate Change Commission, the sole policy-making body of the government to coordinate, monitor, evaluate programs and action plans on climate change (RA 9729, Section 4). In 2010, the tri-sectors of education – DepEd, CHED and TESDA – were directly assigned to integrate disaster risk reduction education in school curricula. In 2011, however, the National Climate Change Action Plan (NCCAP) 2011-2028, formulated as required under RA 9729, made no mention of CHED, but only engaged the inputs of selected HEIs.

RA 9513 offers windows for HEI involvement in education, research and extension services, albeit generally limited and indirect. For instance, Section 28 (a) to (e) mention the tasks of research, renewable energy promotion, conduct of resource and market studies, and propagate RE knowledge, among others, as to the exclusive utilization of the DOE-administered Renewable Energy Trust Fund (RETF).

The passage of the Republic Act 9513 in 2008 entailed some reorganization within the DOE. A Renewable Energy Management Bureau (REMB) was established, effectively dissolving the Renewable Energy Management Division. The REMB is mandated to effectively implement the provisions of the Renewable Energy Act of 2008 and to manage the various R & D activities with regards to renewable energy, together with the various ARECs in the country.

The DOE recognizes its limited presence in the regions of the country such that it chose to partner with HEIs through the establishment of the HEI-based Affiliated Renewable Energy Centers nationwide. On June 22, 2015, it issued Department Order No. DO2015-06-0005 to prescribe the duties and functions of DOE field offices in support of and to strengthen the management and operation of ARECs in the country.

The strengthening of affiliated renewable energy centers was mandated in Section 31(e) of Department Circular No. DC2009-05-0008 or the Rules and Regulations Implementing Republic Act No. 9513. In 2010, the DOE implemented the Household Electrification Program (HEP) in Off-Grid Areas using Renewable Energy. The project, assigned to the Solar and Wind Energy Management Division-Renewable Energy Management Bureau (SWEMD-REMB), was a 7-year project designed to achieve a 90-percent household electrification level by 2017. On December 2, 2013, the Department of Energy (DOE) issued Department Order No. DO2013-12-0019, to institutionalize the accreditation process and strengthen the management and operation of the ARECs. The role of HEIs was to “institutionalize community organizing through enhanced capability of Barangay Power Association (BAPA) in project management, operation and maintenance of RE systems”. The DOE engaged HEIs in two of its RE programs: (1) Household Electrification Program (HEP) in Off-Grid Areas using Renewable Energy, and (2) Biofuels Program through the Biomass Energy Management Division.

The DOE-ANEC Partnerships

The DOE-HEI partnerships in the establishment of ANECs started in 1988 to promote the utilization and commercialization of non-conventional or renewable energy technologies (www.doe.gov.ph). Having no regional offices, the DOE deemed it appropriate to partner with HEIs to accomplish its mandate under RA 9513. It was able to forged 21 partnerships with state universities and colleges (SUCs) and private universities nationwide. The Department Order No. DO2013-12-0019 sets the accreditation criteria and requirement on HEIs as follows (see Table 1):

Table 1. HEI-ANEC Accreditation Criteria and Requirements/Indicators (DO2013-12-0019)

Criteria	Weight (max.)	Requirements
Provision of an AREC office	20%	An office dedicated for AREC, with standard office space, with complete facilities, ventilation, furniture, fixtures that can accommodate the AREC team
Personnel	20%	The AREC team shall consist of at least five qualified personnel: Team Leaders, 3 technical experts with at least a master’s degree to serve as head of the Technical Division, Socio-Economic and Extension Division, & Research and Development division, and at least two administrative staff
Fund complement	20%	
Commitment plan & accomplishment report	20%	Work and Financial Plan approved by the HEI President; and Accomplishment Report, with photos, for 3 years
Research & development capability	15%	At least five (5) completed researches on energy, and at least two (2) publications in reputable journal or international proceedings on the first

		year; and one publication in succeeding years
Energy related accreditation, awards, citations received	5%	Duly certified certifications issued by appropriate agencies
Total	100%	

Among the duties and responsibilities of the ANECs, aside from being able to meet the accreditation criteria, namely:

1. Undertake the implementation of any project such as the Household Electrification Program (HEP) Barangay Electrification Program (BEP);
2. Engage with RE developers in the conceptualization, implementation and evaluation of programs and projects;
3. implement at least two (2) energy related researches and publish the same in a reputable journal;
4. ANEC officials are expected or required to attend meetings, conferences and workshops relative to the formulation, implementation and monitoring of AREC programs;
5. Attend and present researches in annual NREB-ARECs-RE Developers conferences and other for a; and
6. Consider the offering o degree programs on Renewable Energy and other energy related degrees and training

Administratively, every HEI-ANEC has to be able to account for project budgets received from the DOE, use project funds exclusively for the project, implement the projects, submit quarterly technical and financial reports on its accomplishments and project funds utilization, a final report of all activities within specified periods. The HEI has to be able to allocate adequate counterpart funds in support of the ANEC operations.

As stated in DOE issuances, ARECs are the “extension arms or partners of the DOE in implementing RE programs, projects and activities. The partnerships are governed by a Memorandum of Agreement. The DOE Field Offices shall perform technical inspection of any program, project or activity of ARECs and provide them the necessary assistance (DO2015-06-0005). The DOE recently issued a call to strengthen the partnership and establish more HEI-based ARECs (www.bworldonline.com, September 28, 2012).

Renewable Energy Potential and Goal

The national government policy on new and renewable energy is informed by the government’s National Renewable Energy Program (NREP), which seeks to increase RE-based capacity by 200% within the period 2011-2030. Specifically, the government aims to: (a) produce an additional 1,495 MW from geothermal energy; (2) produce up to 2,500 MW of wind energy; (3) double the production of hydro energy by 5,400 MW; and (4) expand renewable energy production from biomass by 265 MW, from solar by at least 280 MW, and

from ocean energy by at least 10 MW (Cerezo 2016:3). Given the country's high potential for generating renewable energy, there is much room for HEIs to participate in capacity building for renewable energy stakeholders, research and development, technology development, testing and demonstration as may be warranted, standard development, and policy development. This should enable the country to produce more energy from renewable sources and reduce dependence on imported energy such as coal.

III ACCOMPLISHMENTS OF HEIS

The DOE identified 20 partner HEIs in the establishment of an AREC (DOE, 2001:27). Additional data gathered from available internet and library materials show three (3) partnerships that have been forged. Data shows (table 1) that the ANEC is located at the College of Engineering (ten HEIs), or at the College of Agriculture (five HEIs). In two private universities, the ANEC was established as an Extension Program (Silliman University) and An Area Research and Training Center University of San Carlos). By region, 11 of the 23 ANECs are located in Luzon.

Table 2. State and Private Universities-Partners of the DOE in the Establishment of Affiliated Non-Conventional/Renewable Energy Centers (ANEC/AREC)
(Source: DOE Guidebook for Developing Sustainable Rural Renewable Energy Services, 2001:27)

	LUZON REGIONS		VISAYAS REGIONS		MINDANAO REGIONS
CAR	Benguet State University (BSU)-ANEC, College of Engineering and Applied Technology	VI	Central Philippine University (CPU)-ANEC, College of Engineering, Iloilo City	IX	Western Mindanao State University ANEC, Zamboanga City
CAR	Kalinga-apayao State College (KASC) ANEC	VIII	University of Eastern Philippines (UEP)-ANEC, Catarman, Northern Samar	X	Central Mindanao University-ANEC, College of Engineering, Bukidnon
I	Mariano Marcos State University (MMSU)-ANEC, College of Agriculture and Forestry	VIII	Visayas State Univrsity (VSU, formerly Vsayas State College of Agriculture)-ANEC, Baybay, Leyte	X	Mindanao State University ANEC, College of Agriculture, Marawi City
I	Don Mariano Marcos Memorial State University (DMMMSU)-ANEC, La Union			XI	University of Southeastern Philippines-ANEC, Davao City
II	Isabela State University (ISU)-ANEC, College of Engineering			XII	Sultan Kudarat Polytechnic State College ANEC
III	Central Luzon State University (CLSU)-ANEC, College of Engineering, Nueva Ecija			XII	University of Southern Mindanao AREC
IVA	Cavite State University (CvSU)-ANEC, College of Engineering				
IVB	Western Philippines University (WPU, formerly State Polytechnic College of Palawan), ANEC, College of Engineering, Aborlan, Palawan	VII	Silliman University-ANEC, University Extension Program (Private HEI)	X	Xavier University-ANEC, College of Agriculture, Cagayan de Oro City (Private HEI)
V	Central Bicol State University of Agriculture (CBSUA), formerly Camarines Sur State Agricultural College)	VII	University of San Carlos-ANEC, Area Research and Training Center, Cebu City (Private HEI)		
III	Pampanga State Agricultural University (PSAU)-AREC, College of Resource Engineering Automation and Mechanization (recent)	VIII	Southern Leyte State University AREC, College of Engineering (recent)		
IVB	Palawan State University (PSU)-AREC, College of Engineering, Architecture and				

Technology (CEAT) (recent)				
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Available data on the year the ANEC was established show that at least ten (10) of them were put up between 1987 and 1996. Eight (8) ARECs were organized between 2007 and 2015. This suggest that the ANECs established much earlier have much more experienced in managing the ANEC and have much more programs and accomplishments to offer.

Table 3. Year of Establishment of the ANEC/AREC

Region	Name of the University & Year the ANEC was established	
I	Mariano Marcos State University (MMSU)-ANEC	1989
CAR	Kalinga-Apayao State College (KASC)-ANEC	1996
CAR	Kalinga State University (KSU)-ANEC	1996
III	Central Luzon State University (CLSU)-ANEC	1996
III	Pampanga State Agricultural University (PSAU)-AREC	2009
IVA	Cavite State University (CvSU)-ANEC	1987
IVB	Palawan State University (PSU)-ANEC	June 2014
IVB	Western Philippines University (WPU)-ANEC, Aborlan, Palawan	1995
VI	Central Philippine University (CPU)-ANEC, Iloilo City	1989
VI	Cebu Technological University (CTU)-AREC	July 2012
VIII	Southern Leyte State University (SLSU)-AREC	June 30, 2015
VIII	Eastern Samar State University (ESSU)-AREC	June 4, 2014
VIII	University of Eastern Philippines (UEP)-ANEC, Catarman, Northern Samar	Early 1990s
X	Mindanao University of Science and Technology (MUST)-AREC	June 2015
X	Central Mindanao University (CMU)-AREC, Cotabato	Prior to 2000
IX	Western Mindanao State University (WMSU)-ANEC, Zamboanga City	1987
XI	University of Southeastern Philippines (USEP)-ANEC, Davao City	1993
XII ARMM	University of Southern Mindanao (USM)-AREC, Cotabato	June 2014
XII ARMM	Mindanao State University (MSU)-ANEC, Marawi City; Iligan	2007

In terms of projects and areas of specialization, SUCs like the Cavite State University (CvSU), and the Central Bicol University of Agriculture have developed their areas of expertise. CvSU has developed a niche in research, technical skill and knowledge in biogas technology (Dilidili, 2011).

Table 4. HEI-ANEC's Sample Projects and Research/Extension Specialization

Region	University	Sample Projects & Specialization
I	MMSU	Process improvement & waste minimization in chicharon manufacturing; field test of heat pump driers for agricultural products,
II	ISU	technical assistance on biogas systems and PV-BCS; installation of biogas system in Brgy. Mabini and Brgy. Salvacion, Santiago City
CAR	BSU	aquaculture, irrigation systems, RE systems; established the Climate-Smart Agriculture Center in 2012 with support of DA
CAR	KASC	Energized 1,942 households in the provinces of Kalinga and Apayao
III	CLSU	Wind resource assessment; climate mitigation advocacy and capacity building; solar home systems

III	MSAU	Solar streetlights and one communal solar home systems
IVA	CvSU	Biogas technology; technical assistance to LGUs, BAPA social preparation
IVB	PSU	adoption/development of pico-hydro power system for barangay electrification; development of portable bio-digester for kitchen wastes and cashew apple wastes; briquetting of oil palm husks; conduct of RE resource assessment; establish linkages with industries; crafting of the power development plan for the province of Palawan
IVB	WPU	undertake the implementation of projects of the DOE such as the Household Electrification Program, Barangay Electrification Program, and other related RE programs; engage with RE developers
V	CBSUA	Agricultural policy reform advocacy; establish the Regional center for Disaster Risk Management and Climate Change Adaptation; Regional AREC; National Training and Knowledge Center for Protected Area Management And Biodiversity Conservation; Agro-Climatic Advisory Center; deliver extension program on climate risk management and disaster preparedness
VI	CPU	covers the islands of Panay and Guimaras; implemented in 2001 the O-Ilaw barangay electrification program in Estancia's 3 island barangays – Loguingot, Manipulon and Bayas; established 78 projects, which include 44 solar systems, 2 wind-solar hybrids, and 1 micro-hydro-solar hybrid
VI	CTU	Technical assessment of RE facilities; rehabilitation of solar grid hybrid pumping system; solar energy training
VIII	SLSU	to expand our network with fellow ARECs; collaborate with private companies who invest in renewable energy; venture into installing solar energy panels in SLSU campuses to drive down energy costs; help poor households in remote areas to have their own electricity.
VIII	ESSU	Initially, to implement a solar energy farm which will double as Student Center where the rice land in front of the Administration Building is currently located.
X	CMU	provision of solar panels & storage batteries to Barangay Lipa, first in 2000 (communal PV-BCS as charger energizing 10 HH, then system rehabilitation on April 14-20, 2008, benefitting 30 HH (KAABAG 2008:2, 9)
XII ARMM	MSU	Develop alternative technology for processing chromite and laterite ores
XII ARMM	USM	Conduct rapid rural appraisal ; provide solar home systems in remote communities that are outside the priorities of electric cooperatives in the area; assess of energy resources in the Provinces of North Cotabato and Maguindanao ; and formulate local energy plans
VI	USC (private HEI)	installed 14 water pumps way back in September 1997 in remote villages in Cebu, Mindoro Occidental, Cavite and Leyte (Forsyth 2013)
X	XU (Private HEI)	Cassava ethanol research; solar street lights along streets going to the Typhoon Sendong resettlement area

A number of the HEIs have not only engaged in research, technology development, capability building and extension services. As mandated in the agreement with the DOE, some HEIs have developed full degree courses on or related to renewable energy, climate change and disaster risk management at the undergraduate and graduate levels. The table below gathers information on degree programs offered by the HEIs. Foremost in the list are MMSU's Professional Master in Renewable Energy Engineering program; CLSU's Master and Doctor in Renewable Energy Systems; PSU-Palawan's BS in Petroleum Engineering; BU's Master of emergency Management, and Master of Public Administration, dole major in Health and Disaster Management; and CBSUA's ladderized MS in Disaster Risk Management.

Table 5. State Universities and Colleges Degree Programs on/or related to Climate Change

	HEI	Location of ANEC	Degree Program
I	MMSU	College of Agriculture & Forestry	Professional Master's Program in Renewable Energy Engineering (2-year program)
I	DMMMSU- Main	College of Engineering College of Graduate Studies	BS in agricultural Engineering MS in Agroforestry MS Environmental Studies [more]
II	ISU	College of Engineering College of Agriculture	MS in agricultural Engineering MS in Agricultural Sciences PhD in agricultural Sciences BS in Agriculture BS in Forestry
CAR	BSU	College of Engineering & Applied Technology	BS Agriculture; BS in Environmental Science, major in Environmental Risk Assessment; Pollution & Waste Management; Global Change; Resource Management; Urban Planning
CAR	KASC	College of Agriculture College of Forestry	BS in Agricultural Engineering BS in Forestry BS in Agriculture BS in Agro-Forestry
CAR	KSU	College of Agriculture College of Forestry	BS in Agricultural Engineering BS in Forestry BS in Agro-Forestry
III	CLSU	o CLSU Open University-Department of Renewable Energy in collaboration with the College of Engineering-CLSU-AREC and Environmental Management Institute o College of Engineering	o Master in Renewable Energy Systems o Doctor in Renewable Energy systems o BS in Agricultural & Biosystems Engineering, specialization in Agricultural Mechanization and Renewable Energy
III	PSAU	o College of Resource Engineering Automation and Mechanization o College of Agriculture Systems & Technology	o BS in Agricultural Engineering o BS Animal Science; Crop Science; Fishery; Agroforestry
IVA	CvSU	College of Engineering	o Master of Engineering in Water Engineering and Management ; o BS in Agricultural Engineering ; o MS in Agricultural Engineering
IVB	PSU	College of Engineering, Architecture and Technology (CEAT)	BS in Petroleum Engineering
V	BU	o College of Medicine; o Graduate School	o Master of Emergency Management; o Master of Public Administration-major in Health and Disaster Management
V	CBSUA	Graduate School	o (Ladderized) Diploma in Disaster Risk Management; and o Master of Science in Disaster-Risk Management
VIII	VSU	College of Engineering College of Agriculture and Food Science College of Forestry & Environmental Science	BS Agricultural Engineering BS/MS/PhD in Animal Science Bachelor of Science in Environmental Management
X	CMU, Bukidnon	College of Forestry and Environmental Science	o Bachelor of Science in Environmental Science o Bachelor of Science in Forestry
XI	UEP	College of Engineering	o MS in Environmental & Resource Management; o MS in Agriculture, major in Soil Science o Master of Engineering, major in Energy Technology o BS in Mining Engineering o BS in Geodetic Engineering o BS in Geology

In terms of research, extension and capacity building, there is much evidence that the ANECs have engaged in substantive amount of research on renewable energy and climate change related activities. Research data from the internet and websites of the concerned HIEs reveal a rich and varies amount of research and training materials and information about the various activities of HEIs.

Case Briefs: Cavite State University and Western Palawan University

Case Brief #1. Cavite State University (CvSU)-ANEC	
<ul style="list-style-type: none"> • The CvSU-ANEC entered into a MOA with DOE in 1987. It began operations in 1988. One of the major activities of CvSU-ANEC was the conduct of the survey on the use of renewable energy in Regions IV-A and IVB. The ANEC promotes biomass technology, which became its chosen area of specialization. Among its project accomplishments back in 1994 was the production of 200 DSAC-Model biogas digester. • The partnership with the DOE helped promote the name of the university. It is now known expert in the area of biogas technology, developed faculty capability in renewable energy, and had patented biogas technology. According to the AREC Technical staff, they have institutionalized the AREC at CvSU, with specialization in biogas technology. As a result, CvSU professors are consulted by other state universities who wish to avail of training and technical assistance and local governments who wish to be helped in using biogas technology to improve the management of local markets and slaughterhouses, and to provide biogas projects for households. 	<ul style="list-style-type: none"> • The AREC was a big factor in the bid of CvSU to secure the Center of Excellence accreditation for the College of Agriculture. The AREC has developed expertise in the conduct of rural energy surveys and development of rural energy plans, preparation of techno-economic feasibility studies of new and renewable energy systems (NRES), prepare engineering designs, and provide technical supervision in the construction, installation, operation, repair and maintenance of new and renewable energy sources. • CvSU is now a Technical Education and Skills Development Authority (TESDA)-assessment Center for Biogas Technician. It has lined up training programs for owners of slaughterhouses, on Balloon Technology. • The AREC continues to be managed by six highly qualified staff following the DOE requirement. It has developed a number of biogas technology that are now available for commercialization such as biomass energy technology (produces gas [for cooking] using animal manure and crop residues) and cookstove.

Case Brief #2 Western Palawan University (WPU)-ANEC

- The WPU's accomplishments include the establishment of a databank on renewable energy. It implemented electrification projects using individual solar home systems. During the years 1998 to 2000, the ANEC was able to energize 40 HH per barangay in 14 barangays of Aborlan, Palawan. They have trained and continue to train Barangay Technicians.
- Through the AREC, WPU has been tasked by the DOE to design hydro power plant that can energize 100 households in Region IV-B. The WPU-AREC was also tapped by the UNDP in 2005 to develop the El Nido solar power plant project.
- The AREC has six personnel (Project Leader, Head of Technical Division, Head of Extension Division, 2 Science Research Specialist, and 1 Clerk. They had the opportunity to develop expertise in solar and hydro power technology, and be exposed to community organizing and social preparation processes. The personnel dedicated themselves to achieve the objectives of the AREC and received from the DOE a certification as Certified RE Engineers.

IV SUMMARY OF FINDINGS AND CONCLUSION

The above discussion on the accomplishments of HEI is highlighted by the degree programs on or related to climate change, projects and research and training specialization, and specific accomplishments as ANECs. The findings show that majority (14 out of 23) of the HEIs have through the years, developed their areas of expertise in renewable energy in or around climate change issues. The two case briefs show the rich benefits gained by HEIs from the partnerships in terms of university strengthening of programs, capability building for faculty and staff resources and conduct of research and extension activities that were directly or indirectly caused by the presence of the ANEC.

The DOE has two programs where ARECs are tapped in their implementation: the Household Electrification Program (HEP), and the Biofuels Program. The HEP is a seven (7)-year project implemented by the DOE in line with the aim of achieving a 90 percent household electrification level by 2017. The project aims to electrify 2,000 households in off-grid and hard to reach areas using solar home systems and other available renewable energy sources. As a policy, the DOE is assisted by ANECs in realizing this objective through community organizing and institutionalization of Barangay Power Associations (BAPA) who shall manage, operate and maintain RE systems. The DOE biofuels program aims to promote the use of biofuels (biodiesel and bioethanol) as cleaner alternative fuel. The HEP is administered by the Solar and Wind Energy Management Division – Renewable Energy Management Bureau (SWEMD-REMB). The Biofuels Program is under the management of the Biomass Energy Management Division – Renewable Energy Management Bureau (BEMD-REMB). As far as HEI-ANECs are concerned, however, reporting and coordination with the DOE is a little more difficult since they have to deal with two separate bureaus.

HEI-AREC Contribution to the Household Electrification Program

In October 2006, the DOE (2006:1) reports a total of 2,419 un-electrified barangays. As of December 31, 2014, the Philippine Statistics Authority (2015:14-16) reports a 99% barangay

energization (36,052 out of 36,063 barangays) and 83% household energization rate (10,636,110 HH out of a potential 12,858,700 HH). The goal of the DOE is to achieve a 90% household electrification this year, 2017, particularly through the Expanded Rural Electrification Program. The DOE implements the Barangay Electrification Program in remote, off-grid barangays through the provision of Battery Charging Stations or individual Solar Home System, micro-hydro systems and wind turbine energy systems (www.doe.gov.ph). The involvement of ANECs comes in this area.

IV POLICY AND RESEARCH RECOMMENDATION

The direct contribution of the ANECs to the DOE's Household Electrification Program (HEP) in off-grid areas using renewable energy is clear and direct, but not clearly reported and attributed. Determining the impact of ARECs and the contributions of HEIs in the overall effort of rural or barangay electrification and promotion of renewable energy remains a challenge considering the absence of readily available data that recognizes their contribution. The same observation cited above on the lack of direct reference on the role of HEI and their contributions makes it difficult to determine how they may be able to contribute more. The HEIs themselves must be able to systematically measure and report their respective accomplishments and make these statistics be part of the national statistics.

The above discussion needs to be expanded to include the vast amount of programs and accomplishments of many other HEIs (Cuaresma 2017:81) have institutionalized to make their respective contributions towards the development of renewable energy resources and address climate change challenges. The climate change centers and many other centers or institutes established within the University of the Philippines System, through its various campuses, colleges and institutes can be cited, i.e., UP Diliman College of Engineering, Electrical and Electronics Engineering Institute on wind turbine generator testing, UP Los Banos National Institute of Molecular Biology and Biotechnology on fuel ethanol production from lignocellulosic feedstock program, UP Mindanao on ethanol and lactic acid-sago program Triple-E, is strongly engaged in matters of climate change education, research, capacity building, consultancy and extension (www.up.edu.ph; DOE 2013:7; PCIEERD 2013:9).

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