CPU Research NEWSLETTER

Official Publication of the University Research Center
Central Philippine University, Jaro, Iloilo City

Volume 10 No. 2 JULY 2012

CPU receives Best Higher Education Institution Research Program Award

Central Philippine University received the Plaque of Recognition as 1st Regional Qualifier for Best Higher Education Institution Research Program (BHEIRP) by the Commission On Higher Education (CHED) last December 2011 for the research program entitled, "Development of Indigenous Feeds for Native Chicken".

Considered as Best Research Program in Western Visayas by the Commission on Higher Education, the work was done by Dr. Jaime C. Cabarles, Jr. (Program Leader), Engr. Aries Roda D. Romallosa (Researcher), and Dr. Reynaldo N. Dusaran Dean College of Agriculture, Resources and Environmental Sciences- all from CPU.

The research program was an upshot of the CPU CARES development of low-cost village level type pellet mill (also by Cabarles, Romallosa and Dusaran) which received an award previously from the Western Visayas Agriculture and Resources Research and Development Consortium (WESVARRDEC).

The pellet mill proved beneficial to livestocks raisers as they can use it in making their own feeds instead of buying the expensive commercial feeds. It will help farmers in formulating and processing their own ration and process this into pellets. "Pelletized feeds are more economical to use than mash feed", according to Engr. Aries Roda D. Romallosa.

The machine is expected to be used not only by individual farmers but also by cooperatives or farmers' groups who want to produce feeds for commercial purposes. The machine costs P60,000 and can pelletize 610 kilos in 8 hours. It was also acknowledged that Pelletized feeds are more palatable and have higher nutrient density than mash feeds. They have longer shelf life and are easier to store. ✱

CPU Hosts Philippine Psychologists' Convention

Eight hundred ninety six psychologists and allied helping professionals coming from different parts of the country, one of the convention's largest turnout, gathered together in the CITY of LOVE---Iloilo City for the 48th Annual Convention of the Psychological Association of the Philippines (PAP) held at the Iloilo Grand Hotel on August 17 to 19, 2011 with this year's theme, "RA 10029: Promoting Excellence in the Practice of Psychology" with Central Philippine University (CPU) as the Co-Host Institution.

The CPU delegates were Prof. Pedro P. Galeno (Convention Co-Chair), Prof. Raquel L. Polec-eo, Prof. Darril F. Pamocol, and Ms. Florabel Santacera-Suarez (Members of the Local Organizing Committee) with Prof. Jelvit Amor C. Alicante and Prof. Orpha Vic S. Faraon including the CPU AB Psychology Alumni and the CPU Psychological Society members as student volunteers. ☞ ...to page 2

During the Closing Program : [from l eft] Dr. Jerry Jurisprudencia (Convention Chair), Dr. Ma. Caridad Tarroja (PAP President) and Dr. Mira Alexis Ofreneo (PAP Vice President) [fourth from left] presenting the Certificate of Appreciation for CPU as Co -Host Institution for the 2011 PAP Conven tion to Prof. Galeno .

In this issue...

CPU Hosts... from page 1

The convention highlighted how RA 10029 (Philippine Psychology Act of 2009), signed as law last March 16, 2010, shape and impact the future of psychology in the Philippines, including the teaching of psychology, the conduct of licensure examinations, and the implementation of regulatory measures.

The convention featured the well-received keynote speech by Dr. Ma. Lourdes Arellano-Carandang - National Social Scientist and renowned Clinical Child Psychologist and Family Therapist. It also featured a Plenary Symposium on the Psychology Law and Ethics, symposia, oral paper presentations, poster research exhibits, and continuing professional education workshops on the diverse areas of specialization in psychology.

CPU participated as well in the scientific program of the convention, as Prof. Galeno and Prof. Polec-eo, psychology faculty of the Social Sciences Department and registered guidance counselors of the Guidance Services Center together with CPU AB Psychology Alumnae, Ms. Kristine A. Sanico (2003) and Ms. Lea N. Monsale (2011) presented their research work in sports psychology entitled, "Our Love for the Game: Investigating the Motivational Patterns of Filipino Sports Fans" for oral paper presentation for the "Studies on Sports and Play Behavior" Session.

As the host institution, CPU welcomed the PAP Officers, Delegates, and Guests to the Fellowship Dinner, chaired by CAS Dean Dr. Anita U. Illenberger at the CPU Gymnasium on August 18, 2011. Social Sciences Department Chairman, Dr. Irving Domingo L. Rio formally opened the program and the University President, Dr. Teodoro C. Robles welcomed the guests in the University to the Dinner Fellowship with no less than Iloilo Governor, Hon. Arthur D. Defensor, Sr. as the invited special guest speaker for the PAP Fellowship Night. ✱

9TH CPU Research and Development Week Harvests Best Student Researches

Research outputs of graduating Centralians from the different departments of the University were presented in the 10th CPU Students Research Symposium dated March 7, 2012. The research papers were categorized as follows: I. Nursing Related Studies (Experimental), II. High School, Special Science Class, III. College of Agriculture, Resources & Environmental Sciences (Experimental Studies), IV. College of Arts and Sciences MassCom Students (Survey Type), V. College of Arts and Sciences MassCom Students (Content Analysis), VI. Nursing Related Studies (Descriptive), and VII. Business Research. Moderators for each category were Prof. Janet P. Jaco (Nursing Related Studies both for Experimental and Descriptive), Prof. Edgardo P. Gerada (High School Special Science Class), Engr. Aries Roda D. Romallosa (CARES), Dr. Herly Fie U. Cervera (Mass Communication students for both Content Analysis and Descriptive Studies) and Prof. Aquiles S. Sansing (Business Research).

Top three research papers were declared for each category. The First Placers received an incentive of Php 3,000.00 while Second and Third placers received, Php 2,000.00 and Php 1,000.00, respectively.

For Category I., Nursing Related Studies, First Place was awarded to the study entitled, "The Effectiveness of Bugnay (*Antidesma bunius*) as a Hypoglycemic Agent to Induced Diabetic White Mice (*Mus Musculus*)" *by Jennifer Santiago* (presentor), *Jaypee Servigon, Diana Gayle Simbajon, JC Ann Sotelo and Bethel Joy Tabera*. For Category II., High School Special Science Class, First Place is the research, "A Comparative Study on the Effects of the Different Rates of Application of Vermicast from African Night Crawler Earthworms (*Eudrilus eugeniae*) on the Production Performance of Open-Pollinated Variety of Tomatoes (*Lycopersican esculentum*)" *by John Erikson Salarda* (presentor), *Joshua Noble, Angel Grace Pedregosa, Marvea Saladar and April Jade Salva;* Second Place was "Neem (*Azadirachta indica*) Fruit Oil as Mosquito Repellent" *by Keia Joy Harder* (presentor), *Ayanah Javellana, Kim Fernandez, Tonee Golez, John Mathew Labtic and Neil Lapizar;*

☞... to page 3

9TH CPU Research... from page 2

and Third Place is the study on "Mahogany (*Sweitenia mahogani*) Seed Extract as Maggot Insecticide" *by Marie Aimee Siaotong* (presentor), *Aimee Lou Tagaro, Marie Fe Vilchez, Lino Sodusta, Jr, and Jeanette Sargado*. In Category III., First Place is the study on "The Determination of Gas Composition Produced by the Different CPU Rice Husk Stove Models" *by Jasmin P. Napawit*. For Category IV., First Place is the study on "Different Views of Mass Communication Students in Iloilo City Toward Shampoo Advertisements on TV" *by Dina L. Echano*. Second Place is the study on "Knowledge on and Perceptions of Violence on ABS-CBN and GMA 7 News Program" *by Debbie P. Otilano;* and, Third Place is the study on "Presentation of Regional News Segments in TV Patrol and 24 Oras" *by Apols E. Garmay*. For Category V., First Place is the study on "Content Analysis on Philippine-Based Online Advocacies" *by Rochelle C. Munsayac;* Second Place is the study on "Theorizing the Filipina: A Post-Modern Reading of Rizal's Noli Me Tangere" *by Raniel C. Ponteras;* and, Third Place is the study on "The Central Echo in the Shadow of Marcos: An Analysis of Political Duress Affecting Student Papers" *by Reyshimar C. Arguelles*. For Category VI., First Place is the study on "The Level of Compliance on Health Care Practices and Level of Satisfaction on Health Care Services among CPU Birthing Center Clients" *by Grant Ireneo Pilla, Jhaney Payba, Marrianne Joy Polaron, Jophadel Piojo* (presentor), *Christine Rebogbog, Marby Porras, Stephen Keith Panizal, Dareen Perez and Jhann Rey Sajonia*. For Category VII., First Place is the study on "Perceived Concept of Business as a Source of Income among Depressed Families in La Paz, Iloilo City" *by Jonathan Zabel* (presentor), *Vergie Lyn Lasprilla, Alexis Sison, Mary Ann Belgira, Noellie Crez Caballero,*

Mechellyn Celiz, Ma. Glenda Icaro, Christine Panganiban, Milka Mae Saligumba and Lenie Solis; Second Place is the study on "The Marketing Strategies, Characteristics of Coffee Shops, and Advertising Methods Associated with Brand Loyalty" *by Brooke Cherith Sta. Lucia* (presentor), *Darlene Ann Gonzales, Lea Mae Bitamor, Diana Lyn Atienza and Myra Andrea Casania;* and Third Place is the study on "House Preference as Influenced by Selected Variables among Residents of Barangay Bagumbayan, Tigbauan, Iloilo" *by Darienne Maestrecampo* (presentor), *Rhea Mar Martizano, Sherrymae Maternal and John Paul Chua*.

This annual week-long activity is made possible through the University Research Committee under the leadership of Dr. Reynaldo N. Dusaran, the CPU Administration, faculty and staff, and students. Announcement and awarding of winners commenced on the 9th of March with an inspirational message from Prof. Rowena M. Libo-on, Vice President for Finance and Enterprises. ✱

13th Faculty Research Symposium features researches on Moringa and Native Chicken

One of the main features of the 9th Research and Development Week is the Faculty Research Symposium. The week long activity started with the exhibit of student research posters followed by a series of faculty paper presentations.

For the morning session of the CPU Faculty Research Symposium, researches on "Horticultural Characterization and Propagation of Moringa Germaplasm at AVRDC The World Vegetable Center" was presented by Dr. Manuel C. Palada, a Visiting Professor, CARES. "Adaptability and Horticultural Characterization of Different Moringa Accessions under Local Conditions (Study I Observational Nursery) was presented by Prof. Hope G. Patricio, Faculty, CARES. Briquetting of Biomass and Urban Wastes using a Household Briquette Molder" was presented by Engr. Aries Roda D. Romallosa, Chairperson, APPROTECH, CARES, ☞ ...to page 4

13th Faculty ... from page 3

while Dr. Jaime C. Cabarles, Jr. Faculty, CARES, presented his study on "Genotype-By-Environment Interactions of Traditional Chicken (*Gallus gallus domesticus* L.) Groups in Western Visayas, Philippines.

In the afternoon session, another set of four presenters namely: Dr. Cirilo C. Calibjo, Dean, College of Computer Studies, Dr. Alberto A. Java, Supervisor, Work Study Service Program and Faculty, College of Engineering, Dr. Margen A. Java, Director, Scholarship Office (in lieu of Ms. Roella Cheyenne C. Aberia of the Placement Office), and Dr. Herly Fie U. Cervera, Faculty, Department of Languages, Mass Communication and Humanities, College of Arts and Sciences, presented their research papers on 1) "Development of a Reference Grid Performance Assessment Model"; 2) "How Well Do Engineers Teach? Do Background Experiences and Commitment Matter"; 3) "The Employability of Graduates: An Assessment of the Scholarship and Placement Services 0f Central Philippine University"; and 4) "The Extent of Use of Online Social Networks and Interpersonal Relations: Their Implication to Teaching and Learning", respectively. ✱

URC conducts Seminar-Workshop on Data Processing, Analysis and Interpretation

To extend further assistance to graduating students who are in the process of writing their thesis, the University Research Center conducted a seminar-workshop on data processing, analysis and interpretation. These students from the College of Business and Accountancy, Education, MassCom and Nursing are under the following research advisers: Dr. Robert E. Ponje, Dr. Reynaldo N. Dusaran, Prof. Salvacion H. Belonio, Dr. Leny Rose P. Mucho, Dr. Betty T. Polido, Prof. Janet P. Jaco and Prof. Lucell A. Larawan.

Resource speakers for the Seminar-Workshop were Prof. Janet P. Jaco, faculty of the College of Education and Prof. Mylene S. Calibjo, Chairperson, Math and Physics Department.

Some of the topics discussed in the seminar-workshop were: Steps in Data Processing, Types of Analysis and Statistical Measures of Relationship among others.

The seminar-workshop was attended by 79 student participants. ✱

CPU Mass Com student researchers silver medalist in National Student Research Grand Prix

Mary Melliecent Cuarte, Dina Echano and Reychelle Mae Gallenero, 3rd year Mass Communication students of Central Philippine University, were awarded the Silver Medal for their research paper entitled, "*Dagyang ta! Reconstructing Youth, Media, and Culture*" in the 2011 Asian Congress for Media and Communication (Philippines).

The Mass Com student researchers represented Central Philippine University in the said Asian Congress and competed in the National Student Research Grand Prix held at Lyceum of the Philippines University on the 25th of November 2011. With the financial support of the CPU Student Affairs Office and the advisorship of Dr. Herly Fie U. Cervera, faculty of the Department of Languages, Mass Communication and Humanities (DLMCH), College of Arts and Sciences, the student researchers bagged the Silver Medal. ✱

Dusaran Heads the University Research Center

Dr. Reynaldo N. Dusaran, now appointed as full-time director of the University Research Center (URC), has been at the helm of the Center since 2010. For the last 2 years, Dr. Dusaran had been concurrently serving as Dean of the College of Agriculture, Resources and Environmental Sciences (CARES) and Director of the URC. His full-time directorship is made possible by the return of Dr. Jaime C. Cabarles, Jr. after completion of his doctoral degree in Animal Breeding last November 2011. An alumnus of CARES and an active researcher, Dr. Cabarles assumed the Deanship effective first semester, SY 2012-2013. ✱

CPUHS Special Science Class tops university wide research poster presenters

Twelve presenters from three departments (Business and Accountancy, High School and Nursing) presented and exhibited their research posters in the 10th Student Research Symposium, one of the highlights of the 9th CPU Research and Development Week last March 5-9, 2012.

Evaluated and judged as First place is the entry of the University High School Special Science Class entitled, "A Comparative Study on the Effects of the Different Rates of Application of Vermicast from African Night crawler Earthworms (*Eudrilus Eugeniae*) on the Production Performance of Open-Pollinated Variety of Tomatoes (*Lycopersican esculentum*) *by John Erikson Salarda, Joshua Noble, Angel Grace Pedregosa, Marvea Saladar and April Jade Salva.* The Second and Third Placers were from the College of Nursing. The Second Placer is the study on "Bullying Experiences and Coping Responses among First Year High School Students in Selected Private and Public Secondary Schools in Iloilo City" *by Helvie A. Arones, Mark Arlu L. Artillo, Julie Ann S. Ami, Shaine Mae C. Arceta, Irish Mae S. Alenciaga, Erl Jay S. Amaguin, Kathrina Mae P. Arillo and cyrine F. Apura.* The Third Best Poster, is about "The Effectiveness of Bugnay (*Antidesma bunius*) as a Hypoglycemic Agent to Induced Diabetic White Mice (*Mus musculus*)" by Jennifer Santiago, Jaypee Servigon, Diana Gayle Simbajon, JC Ann Sotelo and Bethel Joy Tabera. An incentive of Php 3,000.00, Php 2,000.00 and Php 1,000.00 were given to the top three posters.

The top three posters are presently exhibited at the University Research Center Conference Room. ✱

URC on its 3rd year of extending technical assistance to Sta. Barbara Nat'l. Comprehensive High School

For the past three years, Sta. Barbara National Comprehensive High School IV-SSC has requested technical assistance from the University Research Center (URC) to further improve their research outputs. Help is provided by the URESCOM team consisting of Dr. Ilda G. Borlongan (chairperson), Prof. Hope G. Patricio, Prof. Janet P. Jaco, Engr. Ramon A. Alguidano, Jr. and Engr. Aries Roda D. Romallosa along with the URC Director Dr. Reynaldo N. Dusaran.

Of the 12 research studies of the IV-SSC in school year 2009-2010, three papers were chosen to represent the Division of Iloilo in the Regional Science Fair in La Carlota City, Negros Occidental and all three were winners in the Regional Level. The 12 research studies were also qualifying entries in the Division Level Contest, however only the first and second placers represented the Division in the Regional Level. In school year 2010-2011, five of the 14 research studies made it in the Regional Level but all 14 studies were qualifying entries in the Division Level Contest. Last school year, 2011-2012, all 13 of their research studies again

qualified in the Division Level five of which were chosen to represent the Division of Iloilo in the Regional Science Fair. Their research study on Innovative Aero-Turbine on Motorcar (i-Atom) won First Place in the Regional Science Fair. It also won as Best Poster and Best Presentor with Jade Parreño, Mare Christopher Sinfuego, Keith Zydrich Silveo and Jade Parreño as researchers. ✱

Patricio Chairs Panel of Evaluators in the BPI-LGNCRDC 2012 Pre-in-house Review

Prof. Hope G. Patricio, faculty and student research coordinator of the College of Agriculture, Resources and Environmental Sciences (CARES) for the second time sat in the Bureau of Plant Industry, La Granja National Crop Research and Development Center (BPI-LGNCRDC) pre-in-house review last June 26-27, 2012 in La Granja, La Carlota City. Prof. Patricio together with the committee members, namely the Agricultural Center Chief IV of OPA Negros Occidental, and the Supervising and Senior Agriculturists from BPI-Central Office evaluated 22 papers composed of 2 completed studies, 2 on-going projects on plant genetic resources, 8 on crop improvement, 1 on crop protection, 6 Bureau of Agricultural Research (BAR) - funded projects and 3 National Cooperative Testing projects. This was in preparation for the National in-house review in Manila. ✱

Reference Grid Performance .... from page 13

Table 3. Greenfield Plan Solutions with Generation Rescheduling:

	Least Investment Cost Expansion	Least Rental Cost Expansion	No Curtailed Load Expansion
Total Cost (x10^3)	427,082.00	465,641.00	719,660.00
Rental Cost	41,588.83	0.00	46,972.60
Load Curtailed	2,630.40	2,035.70	0.00

Table 4. Greenfield Plan Solutions with Generation Rescheduling

	Least Investment Cost Expansion	Least Rental Cost Expansion	No Curtailed Load Expansion
Total Cost (x10^3)	483,611.00	483,611.00	746,590.00
Rental Cost	0.00	0.00	0.00
Load Curtailed	3,611.80	3,611.80	0.00

The indicated costs would therefore be used as a benchmark for evaluating expansion plans for the test system.

Conclusion

A Reference Grid Performance Assessment Model is developed that can be used as a benchmark when evaluating investment proposals for the transmission upgrade, using a novel non-dominated sorting differential evolutionary algorithm (NSDEA) procedure on a DC power flow based multi-objective transmission expansion planning (MOTEP) formulation. Investment cost, line rental cost and amount of load curtailment are considered in the optimization as the three objective prerequisites. ✱

"God who supplies seed to the sower and bread for food will also supply and increase your store of seed and will enlarge the harvest of your righteousness."
2 Corinthians 9:10

A Comparative Study on the Effects of the Different Rates of Application of Vermicast from African Night Crawler Earthworms (*Eudrilus eugeniae*) on the Production Performance of Open-Pollinated Variety of Tomatoes (*Lycopersican esculentum*)

(by John Erikson Salarda, Joshua Noble, Angel Grace Pedregosa, Marvea Saladar and April Jade Salva)

ABSTRACT

This research was undertaken in order to determine the yield and income from tomato production applied with vermicast at different rates. The nurient content of the soil and vermicast was also assessed. The rates were 0 (control), 1,000 kg/ha, 2,000 kg/ha and 3,000 kg/ha. The treatments were replicated four times and arranged in a randomized Complete Block Design. The data on yield parameters were subjected to analysis of variance and the means were compared using the Least Significant Difference (LSD) test. The results of the analysis of variance were interpreted at 0.05 and 0.01 level while those of LSD test, at 0.05 level. The study revealed that the effects of different rates of vermicast on diameter of fruits, number of marketable fruits, and yield in tons per hectare were significant. The rate of 3,000 kg/ha gave significantly the biggest fruits with the widest diameter. The same test showed that the rates of 3,000 kg/ha and 2,000 kg/ha gave statistically the highest among all treaments. Vermicast has a pH of 6.1 and 29.77 % organic matter, 3.33 % P and 2.68 % K. The pH of the soil in the experimental area decreased from 6.65 to 6.35. The organic matter content increased from 2.5 percent to 3.5 percent, the P content increased from 54 ppm to 78ppm while the K content increased from 808 ppm to 869 pp. The rate of 3,000 kg/ha of vermicast have the highest expenses, gross income, net income and return on investment.

Perceived Concept of Business as a Source of Income among Depressed Families in La Paz, Iloilo City

(by Jonathan Zabel, Vergie Lyn Lasprilla, Alexis Sison, Mary Ann Belgira, Noellie Crez Caballero, Mechellyn Celiz, Ma. Glenda Icaro, Christine Panganiban, Milka Mae Saligumba and Lenie Solis)

ABSTRACT

The primary purpose of this study was to determine the perceptions towards having one's own business among depressed families living in the La Paz area. Specifically, the study aimed to find any differences between age, income, occupation, gender and business ownership of the respondents on their perceptions of having business as an added source of income. The research was carried out in the La Paz area in barangays Hinactacan, San Nicolas, Aguinaldo, Alalasan, Nabitasan, Magdalo, Baldoza, and Sinikway with a total of two hundred respondents. The results of the study showed that despite the differences in gender, occupation, business ownership, and income the perceptions of depressed families living in La Paz were generally the same, having a positive outlook on business as an added source of income.

The Effectiveness of Bugnay (*Antidesma bunius*) as a Hypoglycemic Agent to Induced Diabetic White Mice (*Mus musculus*)

(By Jennifer Santiago, Jaypee Servigon, Diana Gayle Simbajon, JC Ann Sotelo and Bethel Joy Tabera)

ABSTRACT

This experimental study determined the effectiveness of Bugnay (*Antidesmabunius*) as a hypoglycemic agent toinduced diabetic white mice (*Musmusculus*). Specifically, this study determined whether the Bugnay fruit extract had a significant effect on lowering the blood glucose levels of induced diabetic white mice. This study employed the Pretest-Posttest design. The findings of the study disclosed that Bugnay fruit extract was effective as a hypoglycemic agent to induced diabetic white mice. Results revealed that the different concentrations of bugnay significantly decreased that the induced diabetic white mice using the blood glucose. Based on the results of the trials, the 100% extract concentration is more effective than 75%, 50%, 25% concentration and 100% water. Based on the results of the study, the researchers concluded Bugnay fruit extract was an effective hypoglycemic agent in lowering the blood glucose level.

The Central Echo in the Shadow of Marcos: An Analysis of Political Duress Affecting Student Papers

(by Reyshimar C. Arguelles)

ABSTRACT

The primary objective of this study is to determine the effects of political coercion to student papers by citing time frames in which opposition is limited. Qualitative content analysis was employed to determine the level of neutrality, opposition, or support an article expresses by the number of assertions that coincide which such stance. From a total of fifteen articles that were published from 1971 to 1986, neutrality consists 48.05% of all total political assertions, whereas neutrality and opposition consist 0.06% and 45.25%, respectively. It is confirmed that national democratic language is present in some articles, but this is prior to the imposition of martial law. Moreover, the findings suggest that, although there are slight numerical nuances between neutrality and opposition, there exists no significant expression of support for the Marcos administration. Moreover, coercion utilized during the martial law period minimized the publication of antagonizing assertions from 1973 to 1982.

The Level of Compliance on Health Care Practices and Level of Satisfaction on Health Care Services among CPU Birthing Center Clients

(by Grant Ireneo Pilla, Jhaney Payba, Marrianne Joy Polaron, Jophadel Piojo, Christine Rebogbog, Marby Porras, Stephen Keith Panizal, Dareen Perez and Jhann Rey Sajonia)

ABSTRACT

This descriptive relational study was conducted to determine the level of compliance on health care practices and the level of satisfaction on the health care services among CPU Birthing Center clients. This involved 54 mothers who gave birth in the CPU Birthing Center from January 2011 to January 2012. A researcher made questionnaire was used in this study. Percentages, frequency, gamma, and chi-square test were used as tools to analyze data. Results revealed that the level of compliance on health care practices and the level of satisfaction on the health care services of CPU Birthing Center clients were high (Grand mean=14.02, 14.05, respectively). A significant relationship existed between educational attainment and level of satisfaction (gamma=1.00, p value=0.023). However, none of the variables such as age, civil status, monthly income, attitude towards execution of health care practices and level of awareness of programs offered by the CPU Birthing Center were significantly related to their level of satisfaction on the healthcare services. On the other hand, the level of compliance on healthcare practices was not significantly related to the clients' age, civil status, monthly income, educational attainment and attitude towards execution of health care practices and level of awareness of programs offered.

Determination of Gas Composition Produced by the Different CPU Rice Husk Stove Models

(by Jasmin P. Napawit)

ABSTRACT

The general objective of the study was to determine the gas composition produced by the different rice husk stove models designed and developed at CPU. This was conducted from November 10 to 12, 2011 at Central Philippine University, Iloilo City. Results of the study revealed that the four rice husk stove developed, namely the Single-Burner (Model A), Super turbo (Model B), Side-In (Model C), and Conic (Model D) were significantly different from each other as to their carbon dioxide (CO_2), methane (CH_4), and oxygen (O_2) gas compositions. These were due to differences in their designs, processes involved in conversion of energy, and methods of operation. Based on the findings of the study, it is recommended that the gas compositions be further tested using other instruments such as the Orsat Analyzer that could determine carbon dioxide (CO) levels and to verify the results.

Reference Grid Performance Assessment Model for Transmission Company Regulation

By Cirilo C. Calibjo

ABSTRACT

Applying a novel non-dominated sorting differential evolutionary algorithm (NSDEA) procedure to a DC power flow based multi-objective transmission expansion planning (MOTEP) model, this paper aims to develop a Reference Grid Performance Assessment Model that can be used as a benchmark when evaluating investment proposals for the transmission upgrade. Investment cost, line rental cost and amount of load curtailment are considered in the optimization as the three objective prerequisites. In addition, the static MOTEP problem has been investigated in both greenfield and expansion planning problem with and without generation rescheduling considerations. The proposed model was applied to a realistic 46-bus South Brazilian system. Simulation results show the accuracy, outstanding convergence performance in finding the optimal solution, simple implementation as well as satisfactory computation time of the proposed solution technique.

Keywords--reference network; transmission company regulation; multi-objective transmission expansion planning; differential evolutionary algorithm

INTRODUCTION

The restructuring of the electric power industry still requires the regulation of the naturally-monopolistic nature of transmission and distribution networks by setting use-of-system charges and establishing power quality and reliability standards. Open access to the transmission network is a prerequisite for a competitive generation sector in order to realize reduction in electricity prices and stimulate the emergence of new technologies. The transmission network must have sufficient capacity and reliability in order to perform its function in a market environment. Therefore, the regulator faces the challenge of defining a benchmark network to which any proposal for transmission network expansion should be compared. Aside from minimizing capital costs and satisfying system security requirements, the benchmark network should minimize the cost to customers and foster competition and reduce, when possible, the exercise of market power by market participants.

The main task of the regulator is to ensure that tariff setting allows the transmission company to recover its costs plus a reasonable return on its capital, taking into account the risks faced by the company, while promoting incentives to achieve greater efficiency. The traditional regulatory scheme is tire rate of return regulation (ROR) that ensures the regulated company a fixed return on capital, regardless of its costs. Disadvantages of this type of regulation are that it creates a perverse incentive to overinvest and it does not promote efficiency. New regulatory schemes have been developed to stimulate efficiency within the regulated company, under what has been called benchmark regulation that aims to make a monopoly compete with a reference efficient model company [1].

There have been a number of proposals for the use of reference networks in benchmark regulation of mostly distribution networks. In [2] a global remuneration scheme is proposed for distribution utilities which recognizes adequate investment and operation costs, promotes loss reduction and incentivizes the control of the quality of service. Efficient investment and operation costs are calculated by using a static strategic-planning model that determines the optimal distribution network from scratch needed to supply the current demand of a utility's service area at maximum cost effectiveness, by minimizing network investments and losses while considering operational and reliability constraints. The objective of the model is to provide a reference network for determining the remuneration of the distribution utility.

In [1] a hybrid regulatory scheme combines the price-cap scheme and model-company regulation that aims at making the private distribution monopoly compete with a reference efficient model company, through a yardstick-competition approach. It basically corresponds to a competition by comparison, where a specific rate of return for each distributor is not assured nor limited, depending on the results of its relative efficiency compared with the reference model upon which base the tariffs are calculated. The model company is determined from the optimization of a real distribution company that is then benchmarked with all the distribution companies.

The concept of a reference network is proposed in [3] as a means for comparing the optimum improvement that any given distribution network operator can achieve, while the concept of reliability worth assessment is proposed as a means for quantifying the benefit that customers derive from these improvements. In [4] a reference network approach uses a small number of networks that represent the real feeders of the system being considered. First, the real feeders are classified into coherent clusters and a representative network is constructed for each cluster. The reliability of these representative networks is assessed and re-aggregated to obtain overall system reliability. These representative networks are then analyzed repetitively for different investment scenarios and the corresponding reference networks derived. The reference network is identical to the associated representative network in terms of fixed network parameters, but with an optimal set of selected variable parameters that can be changed by appropriate investment. Reference [5] proposes a method for the construction and evaluation of representative networks to assess the impact that performance-driven investment strategies will have on the improvement in reliability indices. In [6] representative networks are obtained using information from real feeders' databases that reflect reliability performance of a group of real feeders with a great accuracy.

The Network Performance Assessment Model (NPAM) in [7]and [8] is based on a reference network that is a fictive electrical distribution system defined from a set of objective prerequisites for a node: geographical position, maximum

load to or from a node, the time distribution of the load, and the nominal voltage level required. The reference network is initially created as a pure radial network that is then adjusted to a redundant network based on a balance between investment cost for the distribution system operator and reduced outage cost for customers. [9] examines the incentive properties and related aspects of NPAM and compares these with frontier-based benchmarking methods.

In [10] the concept of a reference transmission network is proposed as being topologically identical to the existing network, with the existing generation and load layouts and cost characteristics, operating at the same voltage levels as the real one, but the individual transmission circuits would have optimal capacities. In [11] a reference transmission network is proposed using a general game theoretic model. The strategic behavior of market agents in the spot market is modeled by a Supply Function Equilibrium approach.

This study aims to develop a Reference Grid Performance Assessment Model that can be used as a benchmark when evaluating investment proposals for the transmission upgrade, using a novel non-dominated sorting differential evolutionary algorithm (NSDEA) procedure on a DC power flow based multi-objective transmission expansion planning (MOTEP) formulation. Investment cost, line rental cost and amount of load curtailment are considered in the optimization as the three objective prerequisites.

FORMULATION OF THE PROBLEM

A. Multi-objective Transmission Expansion Planning

The objective of transmission expansion planning is to minimize investment cost while satisfying operational and economic constraints. In this paper, the classical DC power flow model is applied to solve the transmission expansion problem. Mathematically, the problem can be formulated as

$$Min \quad f_1 = \sum_{(i,j)\in\Omega} c_{ij} n_{ij} \qquad (1)$$

where f_1, c_{ij} and n_{ij} represent, respectively, transmission investment cost, cost of a candidate circuit for addition to the branch i-j and the number of circuits added to the branch i-j. The following linear equality constraint represents the conservation of power at each node:

$$B\delta = P_G - P_D - P_{tie} \qquad (2)$$

where P_G, P_D, P_{tie}, B, *and* δ *are* real power generation vector in existing power plants, real load demand vector in all network nodes, vector of output power from the study control area to other areas, susceptance matrix of the existing and added lines in the network, and vector of voltage angles in radian, respectively. The following inequality constraint is applied to transmission expansion planning in order to limit the power flow for each path:

$$P_{ij} \le \left(n_{ij}^0 + n_{ij}\right) P_{ij}^{\max} \qquad (3)$$

In DC power flow model, each element of the branch power flow in constraint (3) can be calculated by using

$$P_{ij} = \frac{\left(n_{ij}^0 + n_{ij}\right)}{x_{ij}} \times \left(\delta_i - \delta_j\right) \qquad (4)$$

where P_{ij}, $P_{ij}^{\max}$, n_{ij}, n_{ij}^0 and x_{ij} represents, respectively, total branch power flow in branch *i-j*, maximum branch power flow in branch *i-j*, number of circuits added to branch *i-j*, number of circuits in original base system, and reactance of the branch *i-j*. Here δ_i and δ_j is voltage phase angle of the terminal buses *i* and *j,* respectively. In the transmission expansion planning problem, power generation limit must be included into the problem constraints. This can be mathematically represented as follows:

$$P_G^{\min} \le P_G \le P_G^{\max} \qquad (5)$$

where $P_G^{\min}$ and $P_G^{\max}$ are the $N_b \times 1$ vectors of minimum and maximum active power generation limits in (these vectors are submitted by producers). It is significant for an accurate transmission expansion planning that planners need to know the exact location and capacity of the newly required circuits. Therefore this constraint must be included into the consideration of planning problem. Mathematically, this constraint defines the new circuit location and the maximum number of circuits that can be installed in a specified location. It can be represented as follows:

$$0 \le n_{ij} \le n_{ij}^{\max} \qquad (6)$$

where n_{ij} and $n_{ij}^{\max}$ represents the total integer number of circuits added to the branch *i-j* and the maximum number of added circuits in the branch *i-j,* respectively.

The key to consider marginal loss price is the marginal loss factor, or just loss factor (LF) for simplicity, and the marginal delivery factor, or just delivery factor (DF). Mathematically, they can be written as

$$DF_i = 1 - LF_i = 1 - \frac{\partial P_{Loss}}{\partial P_i} \qquad (7)$$

where

DF_i = marginal delivery factor at Bus *i*;
LF_i = marginal loss factor at Bus *i*;
P_{Loss} = total loss of the system;
$P_i = P_{Gi} - P_{Di}$ = net injection at Bus *i*.

The loss factor and delivery factor can be calculated as follows. Based on the definition of loss factor, we have

$$P_{Loss} = \sum_{k=1}^{N_l} P_k^2 R_k \qquad (8)$$

$$\frac{\partial P_{Loss}}{\partial P_i} = \frac{\partial}{\partial P_i}\left(\sum_{k=1}^{N_l} P_k^2 R_k\right) \qquad (9)$$

where

P_k = line flow at line k
R_k = resistance at line
N_l = total number of lines

This paper employs the concept of fictitious nodal demand (FND) to represent the losses of the lines connected to a bus as proposed in [12] . The FND is similar yet different from the fictitious load and fictitious midpoint bus model in [13]. [13] uses the fictitious load and midpoint bus to partition an inter-area tie line and eventually models multi-area OPF. [12] does not need the fictitious midpoint bus and uses a different representation of the fictitious loss model. More important, FND is applied here to distribute system losses among each individual line. With this approach, the loss in each transmission line is divided into two equal halves, attached to both buses of that line. Each half is represented as if it is an extra nodal demand. For each bus, the total of all

equivalent line losses is the proposed FND. The FND at Bus i is written as E_i, defined as follows:

$$E_i = \frac{1}{2}\sum_{k=1}^{N_{li}} P_k^{\,2} R_k \qquad (10)$$

where N_{li} is the number of lines connected to Bus i. In the linear dc network, a line flow can be viewed as the aggregation of the contribution from all power sources (generation as positive source and load as negative source) based on superposition theorem. The line flow P_k can be obtained from the FND calculation in the previous iteration. Here, is calculated as

$$P_k = \sum_{j=1}^{N_b} GSF_{kj}\left(P_{Gj} - P_{Dj} - E_j^{est}\right) = \sum_{j=1}^{N_b} GSF_{kj}\left(P_j - E_j^{est}\right) \qquad (11)$$

where GSF_{kj} generation shift factor to line from Bus i. Equation (9) can be utilized to further expand LF as

$$\frac{\partial P_{Loss}}{\partial P_i} = \sum_{k=1}^{N_l} \frac{\partial}{\partial P_i}\left(P_k^{\,2} R_k\right) = \sum_{k=1}^{N_l} R_k \times 2P_k \times \frac{\partial P_k}{\partial P_i} \qquad (12)$$
$$= \sum_{k=1}^{N_l} 2 \times R_k \times GSF_{ki} \times \left(\sum_{j=1}^{N_b} GSF_{kj} \times P_j\right)$$

In order to fully account for the line usage of these energy flows in the market, and to allow the market settlement accounts to balance, specific line rental amounts shall be charged corresponding to the amount of energy that were netted out. The formula for the calculation of the total line rental cost is represented as follows:

$$Min \quad f_2 = \sum_{(i,j)\in\Omega}\left(lmp_j P_{ij}^{j} - lmp_i P_{ij}^{i}\right) \qquad (13)$$

where

lmp_j = the locational marginal price at the receiving node j
lmp_j = the locational marginal price at the sending node i
P_{ij}^{j} = the power flow out of the receiving node j
P_{ij}^{j} = the power flow into the sending node i

LMPs are the Lagrange multipliers or shadow prices of the power flow constraints. In this paper, an iterative DCOPF-based algorithm with the FND model as presented in [12] will be used to calculate LMPs. For a given operating point (here the peak-load) they can be computed through an optimization with following objective function:

$$Min \quad \sum_{i=1}^{Nb} c_i P_{Gi} \qquad (14)$$

where

C_i= generation cost at Bus i;
P_{Gi}= generation dispatch at Bus i;

Equation (14) is an optimal power flow modelled as an optimization problem. Objective function is the total cost of running generators. Power flow equations, line flow limits, generation limits, are the constraints of this optimization problem. The objective function (14) represents the total operation cost of the transmission lines, which has some restrictions. These constraints must be included into mathematical model to ensure that the optimal solution satisfies transmission planning requirements. As with the investment criteria, the following DC power flow constraints must be satisfied. The system energy balance constraint that enforces that the total generation should be greater than the total demand by the average system loss. This constraint can be formulated as follows:

$$\sum_{i=1}^{N_b} DF_i^{est} P_{Gi} - \sum_{i=1}^{N_b} DF_i^{est} P_{Di} + P_{loss}^{est} = 0 \qquad (15)$$

The line flow constraints employing the concept of FND to represent losses of the lines connected to a bus is given by

$$\sum_{i=1}^{N_b} GSF_{ki}\left(P_{Gi} - P_{Di} - E_i^{est}\right) \le \left(n_k^0 + n_k\right)P_k^{\max} \qquad (16)$$
$$for \quad k \in all \quad lines$$

The generation limits must be satisfied and is formulated as follows:

$$\overset{\min}{P_G} \le P_G \le \overset{\max}{P_G} \qquad (17)$$

When the above formulation converges using the generation dispatch of each unit (P_{Gi}) as the convergence criterion, other parameters such as the line flows (P_k), the delivery factors (DF_i), and the system loss (P_{Loss}) will converge as well [12]. After obtaining the optimal solution of generation dispatch, the LMP at any Bus b can be calculated with the Lagrangian function. This function and LMP can be written as

$$\psi = \left(\sum_{i=1}^{Nb} c_i P_{Gi}\right) - \lambda\left(\sum_{i=1}^{N_b} DF_i\, P_{Gi} - \sum_{i=1}^{N_b} DF_i\, P_{Di} + P_{Loss}\right)$$
$$- \sum_{k=1}^{N_l}\left(\sum_{i=1}^{N_b} GSF_{ki}\left(P_{Gi} - P_{Di} - E_i\right) - \left(n_k^0 + n_k\right)P_k^{\max}\right) \qquad (18)$$

$$lmp_b = \frac{\partial\psi}{\partial P_{Db}} = \lambda \times DF_b + \left(\sum_{k=1}^{N_l} \mu_k \times GSF_{kb}\right)$$
$$= \lambda + \left(\sum_{k=1}^{N_l} \mu_k \times GSF_{kb}\right) + \lambda\left(DF_b - 1\right) \qquad (19)$$

where

lmp_b= LMP at Bus b
λ = lagragian multiplier of (15) = energy price of the system= price at the reference bus
μ_k = lagragian multiplier of (16) =sensitivity of the k^{th} transmission constraint

From (19), LMP can be easily decomposed into three components: marginal energy price, marginal congestion price and marginal loss price. The LMP formulation can be written as

$$lmp_b = lmp^{energy} + lmp_b^{cong} + lmp_b^{Loss} \qquad (20)$$
$$lmp^{energy} = \lambda \qquad (21)$$
$$lmp_b^{cong} = \sum_{k=1}^{N_l} GSF_{kb} \times \mu_k \qquad (22)$$
$$lmp_b^{Loss} = \lambda\left(DF_b - 1\right) \qquad (23)$$

In this paper, the reliability criterion is modelled as an objective function applying the idea of artificial generation at each load bus. So, the mathematical formulation of the third objective function, providing static reliability, is as follows [14]:

$$Min \quad f_3 = W_0 + W_1$$
$$W_0 = \sum_{k\in N_b} P_{AGk} \qquad (24)$$
$$W_1 = \sum_{mn\in\Psi}\sum_{k\in N_b} P_{AGk}^{mn}$$

where W_0 and W_1 are the total artificial generation (curtailed/shed load) in normal operation without contingencies and the total artificial generation (curtailed/shed load) in single contingency condition, respectively. P_{AGk} And P_{AGk}^{mn} represent artificial generation (curtailed/shed load) at bus in normal and the artificial generation (curtailed/shed load) at bus *k* while a line in right-of-way *m-n* is out of service, respectively, while ψ is a set of selected contingencies. In this paper, the Philippine Grid Code definition of security (single contingency security or N-1) will be considered. Note that the formulation presented in (24) has two advantages: first, the optimization problem will be always feasible due to the presence of the loss of load and second, defining the reliability criteria as an objective will allow the decision maker to run a cost-benefit analysis. The constraints of the modified network topology related to outage of every branch in the set of selected contingencies must be considered. The constraints of the modified network topology related to the outage of line are as follows. Parameters with superscript *mn* denote the modified branch susceptances and bus voltage angles after outage of one of the lines in right-of-way *mn*. These lines can be selected as credible contingencies using a contingency screening method. After an outage of one of the lines in right-of-way *mn*, the linear equality constraint representing the conservation of power at each node must be preserved. This is achieved by applying the idea of artificial generation at each load bus.

$$B^{mn}\delta^{mn} = P_G^{mn} + P_{AG}^{mn} - P_D^{mn} - P_{tie} \quad (25)$$

The following inequality constraint is applied to transmission expansion planning in order to limit the power flow for each path after an outage of one of the lines in right-of-way *mn*. .

$$\begin{aligned} P_{ij}^{mn} &\le \left(n_{ij}^0 + n_{ij} - 1\right)P_{ij}^{\max} \quad ij = mn \\ P_{ij}^{mn} &\le \left(n_{ij}^0 + n_{ij}\right)P_{ij}^{\max} \quad ij \neq mn \end{aligned} \quad (26)$$

where

$$\begin{aligned} P_{ij}^{mn} - B_{ij}^{mn}\left(n_{ij}^0 + n_{ij} - 1\right)\left(\delta_i^{mn} - \delta_j^{mn}\right) &= 0 \quad ij = mn \\ P_{ij}^{mn} - B_{ij}^{mn}\left(n_{ij}^0 + n_{ij}\right)\left(\delta_i^{mn} - \delta_j^{mn}\right) &= 0 \quad ij \neq mn \end{aligned} \quad (27)$$

Power generation limit must be maintained even after an outage of one of the lines in right-of-way *mn*. This can be mathematically represented as follows:

$$P_G^{\min} \le P_G^{mn} \le P_G^{\max} \quad (28)$$

For calculating the amount of load shedding, the priority of load buses for load curtailment has been considered the same in the network. Load will be curtailed if the re-dispatching of generators cannot eliminate overloads in transmission system. This constraint is represented by:

$$0 \le P_{AG}^{mn} \le P_D \quad (29)$$

In order to reflect the overall system overloading, a system performance index (PI) is defined as follows [15]:

$$PI = \sum_{i=1}^{L} \alpha_i w_i \left(\frac{P_i}{\overline{P_i}}\right) \quad (30)$$

where: P_i = active power of line *i*
$\overline{P_i}$ = transmission capacity of line *i*
α_i = number of parallel lines of branch *i*
W_i = weighting factor of line *i*, which reflects the influence of a fault
L = number of branches in the network

A sensitivity analysis of the PI with respect to the change of a line admittance will reveal the impact of an outage on the system security. When line k fails, the change in PI is given by

$$\Delta PI_k = \frac{\partial PI}{\partial B_k} \Delta B_k \quad (31)$$

which can be shown to be equal to

$$\Delta PI_k = \frac{2P_k\gamma_k}{1 - B_k\chi_k} + \frac{P_k^2\tau_k}{\left(1 - B_k\chi_k\right)^2} + \frac{w_k P_k^2}{\left(1 - B_k\chi_k\right)^2 \overline{P_k}}$$

where

$$\gamma_k = \mathbf{e_k^T R} \; ; \; \tau_k = \mathbf{e_k^T T e_k} \; ; \; \chi_k = \mathbf{e_k^T X e_k} \; ; \; \mathbf{R = XW\theta}$$

$$\mathbf{T = XWX} \; ; \; \mathbf{X = B^{-1}} \; ; \; \boldsymbol{\theta} = \mathbf{XP} \; ; \; \mathbf{W = A^T W_d A}$$

$$\mathbf{W_d} = \begin{bmatrix} \frac{\alpha_1 w_1 B_1^2}{\overline{P_1}^2} & & & 0 \\ & \ddots & & \\ & & \frac{\alpha_k w_k B_k^2}{\overline{P_k}^2} & \\ & & & \ddots \\ 0 & & & \frac{\alpha_L w_L B_L^2}{\overline{P_L}^2} \end{bmatrix}$$

$\mathbf{e_k}$ = *transpose of the* k^{th} *row of the incidence matrix* **A**

$$\mathbf{e_k} = \begin{bmatrix} 0 \\ \vdots \\ 1 \leftarrow node\ i \\ \vdots \\ -1 \leftarrow node\ j \\ \vdots \\ 0 \end{bmatrix}$$

A = incidence matrix

Variables in these equations are obtained from the normal load flow calculation. Under the condition that matrices **X**, **W**, **R**, and **T** have been formed, it is very convenient to compute **ΔPI** after a line has failed. The bigger ΔPI_k is, the larger the increase in the PI will be, which indicates that the probability of a faulted line k causing system overloading becomes higher.

B. Non-domnated Sorting Differential Evolution Algorithm

The major steps of NSDEA optimization program for solving static MOTEP problem can be summarized as follows:

Step 1: Read all required transmission system data from database for the static MOTEP calculation, including the data of actual power generation, generation units cost functions, load demand and transmission line system;

Step 2: Set up all required parameters of NSDEA optimization process by the user; These control parameters are population size (*NP*), number of objective functions (*M*), number of variables (*V*), scaling mutation factor (*F*), crossover probability (*CR*), lower and upper bounds of initial population (*xjmin* and *xjmax*) and maximum number of generations (*Gmax*);

Step 3: Select a type of static MOTEP problem, which is either the case with or without power generation resizing consideration; If the case selected does not allow power generation resizing consideration, NSDEA program will use the given actual power generation values from step 1 for the calculation of the three objective functions; If the case selected allows power generation resizing consideration, NSDEA program will compute the proper power generation value, which must be within the given bound from Step 1, for each generation unit in the network;

Step 4: Initialize population P of individuals.

Step 5: Set iteration G = 1 for initialization step of NSDEA optimization process;

Step 6: Calculate and evaluate objective function values of initial individuals and check constraints for each initial individual.

Step 7: Rank the initial individuals according to the following; Classify a population of solutions into the number of non-dominated fronts in which the first front (level 1) is a set of non-dominated solutions in the entire population, the second front (level 2) is a set of non-dominated solutions in the population ignoring the first level and so on until the entire population has been classified into levels.

Step 8: Apply mutation, crossover and selection operators to generate new individuals; Apply mutation operator to generate mutant vectors ($V_i^{(G)}$); Apply crossover operator to generate trial vectors ($U_i^{(G)}$); Apply selection operator by comparing the fitness of trial vector ($U_i^{(G)}$) and the corresponding target vector ($X_i^{(G)}$) and then select one that provides the best solution. In the selection phase, an individual□s non-domination rank biases the probability of being selected for reproduction. The solutions in the first level front have highest priority, and then those in the second level and so forth;

Step 9: Build the subsequent generation according to the following; First, combine a set of new alternatives produced from step 8 with the previous population. Then, sort the combined population with size 2(NP) and classify it into different non-dominated levels. Since all previous solutions are included in the process, elitism is guaranteed. The new population is composed of the first, the second, and other non-dominated levels until all NP population slots are filled.

Step 10: Calculate and evaluate objective function values of new individuals and check constraints for each initial individual.

Step 11: Rank new individuals according to step 7;

Step 12: Choose the best individuals to form the new population;

Step 13: Check the termination criteria; If the maximum number of generations G < Gmax, set G = G + 1 and return to step 8 for repeating to search the solution. Otherwise, stop to calculate and go to step 14;

Step 14: Save the set of non-dominated solutions.

In fuzzy satisfying method, a strictly monotonically decreasing and continuous membership function is assigned to each objective. A linear membership function assignment scheme and decision analysis technique in [16], which is a strictly monotonically decreasing and continuous function type, is used for all objectives as

$$\mu_{fi}(\bar{X})=\begin{cases}0 & f_i(\bar{X})>f_i^{\max}\\ \dfrac{f_i^{\max}-f_i(\bar{X})}{f_i^{\max}-f_i^{\min}} & f_i^{\min}\le f_i(\bar{X})\le f_i^{\max}\\ 1 & f_i(\bar{X})<f_i^{\min}\end{cases} \qquad (32)$$

where $\mu_{fi}(\bar{X})$ is the satisfaction level of solution $\bar{X}$ with respect to the *i*th objective. After defining each membership function, the decision maker decides on the desirable level of achievement of each objective. Desirable levels of achievement are named reference levels of achievement and are given by μ_{ri}. To represent the conservative behavior of a decision maker, the final solution is then obtained using the minimax decision analysis technique. Using this conservative approach, the final solution is found by solving the following optimization problem:

$$\min_{\bar{X}\in\Phi}\left\{\max_i\left|\mu_{ri}-\mu_{fi}(\bar{X})\right|\right\} \qquad (33)$$

where

μ_{ri} is the reference level of achievement of the *i*th objective

Φ is the set of non-dominated solutions

C. Testing & Analysis

The South Brazilian test system is a middle size system with 46 buses and 79 right-of-ways for the addition of new circuits. This system represents a good test to the proposed methodology because it is a real system [14]. The total demand for this system is 6,880MW. In this study, static MOTEP problem is analyzed in both cases, with and without power generation rescheduling for both expansion and greenfield planning. The maximum number of permitted parallel lines permitted for both new and existing right-of-ways is four in all cases.

Table 1. Expansion Plan Solutions with Generation Rescheduling:

	Least Investment Cost Expansion	Least Rental Cost Expansion	No Curtailed Load Expansion
Total Cost (x10^3)	72,870.00	84,183.00	151,934.00
Rental Cost	287,721,681	0.00	28,313.03
Load Curtailed	1,755.80	2,854.30	0.00

Table 2. Expansion Plan Solutions without Generation Rescheduling:

	Least Investment Cost Expansion	Least Rental Cost Expansion	No Curtailed Load Expansion
Total Cost (x10^3)	150,526.00	150,526.00	200,562.00
Rental Cost	0.00	0.00	0.00
Load Curtailed	2,365.00	2,365.00	0.00

☜ … to page 6

Completed Institutional Research Projects September 2011 to April 2012

1. **The Extent of Use of Online Social Networks and Interpersonal Relations: Their Implication to Teaching and Learning**
   - by Herly Fie U. Cervera (completed November 2011)

2. **Genotype-by-Environment Interactions of Traditional Chicken (*Gallus gallus domesticus* L.) Groups in Western Visayas, Philippines**
   - by Jaime C. Cabarles, Jr. (completed March 2012)

3. **In-service Education Needs of CPU Faculty Members in Relation to Selected Variables.**
   - by Janet P. Jaco and Nelson A. Pomado (completed March 2012)

4. **Faces, Facets and Facebook: A Discourse Analysis on Ethos**
   - by Herly Fie U. Cervera (draft report)

Completed Externally Funded Research Projects

1. **Taxonomic and Ecological Study on the Herpetofauna, Chiroptera (Bats), and Macroinvertebrates in Karst Limestone Habitats on Various Philippine Islands, with a Database on Herpetofauna, Chiroptera and Macroinvertebrates**

   - By Reynaldo N. Dusaran, Michael Lawton R. Alcala, Abner A. Bucal, Leonardo T. Averia, Antonio Tambuli, Christine Bentaib, Olga Nuñeza, Hermes Alburo, and Jane Cabauatan (Funded by Commission on Higher Education)
   (Completed May 2012)

2. **Evaluation of the Community and Enterprise Development Program (CEDP) of *Taytay Sa Kauswagan*, Inc. (TSKI)**

   - By Reynaldo N. Dusaran and Randy Anthony V. Pabulayan
   (Funded by *Taytay Sa Kauswagan*, Inc. (TSKI)
   (Completed July 2012)

Ongoing Institutional Research Projects April 2011 to May 2012

1. **Title:** Tracer Study for the College of Agriculture, Resources and Environmental Sciences Graduates from 2006-2010
   Researcher: Reynaldo N. Dusaran

2. **Title:** Nutrient Composition and Antioxidant Property of Philippine Indigenous Vegetables
   Researcher: Ilda G. Borlongan

3. **Title**: Tracer Study for the CPU College of Arts and Sciences Graduates from 2006 - 2010
   Researcher: Edgardo P. Gerada

4. **Title**: Tubiganay: Conflict Resolution Amongst Indigenous Cultural Communities in Central Panay Mountains
   Researchers: Irving Domingo L. Rio and Rodel C. Palomar

5. **Title**: Tracer Study for the CPU College of Theology Graduates from 2006-2010
   Researchers: Grace C. Reyes, Excelyn C. Landero and Rea Angelica F. Villeza

6. **Title**: Tracer Study for the CPU College of Business and Accountancy Graduates from 2006-2010
   Researchers: Nelia G. Bonete, Diosdado N. De la Cruz and Russali S. Baldevarona

7. **Title:** Tracer Study for the CPU College of Education Graduates from 2006 2010
   Researcher: Janet P. Jaco

8. **Title:** Tracer Study for the CPU College of Nursing Graduates from 2006 2010
   Researchers: Nenalyn D. Abioda and Carolyn L. Yoro

9. **Title:** Tracer Study for the CPU College of Engineering Graduates from 2006-2010
   Researchers: Rowena P. Calasara and Mary Earl Daryl A. Grio

10. **Title:** Graduate Tracer Study for the CPU College of Computer Studies Graduates from 2006 2010
    Researchers: Ma. Shiela C. Sapul and Mary 'O T. Penetrante

11. **Title:** Faculty Members' Level of Satisfaction on the Institutional Services of the University
    Researcher: Merle L. Junsay

12. **Title:** An Evaluative Analysis of English Language for Korean Program (FLKP) of Central Philippine University
    Researchers: Leilani Fatimah L. Trompeta, Anita U. Illenberger and Herly Fie U. Cervera

13. **Title**: CPU Staff, AY 2011-2012: Level of Satisfaction on Different University Services, Their Rights, Privileges and Functions
    Researcher: Fely D. Armadillo

Ongoing Externally Funded Research Projects

1. **Formulation and Distribution Feed Rations for Free-Range Native Chicken**

   - By Jaime C. Cabarles, Jr.
   (Funded by Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD))

2. **Citizen Satisfaction Index System (CSIS)**

   - By Reynaldo N. Dusaran
   (Funded by Department of the Interior and Local Government, Region VI)

Director's Desk

By Dr. Reynaldo N. Dusaran

Research and Accreditation

The University is a firm believer of the importance of accreditation as a means of gauging and improving the quality of its educational services. Accreditation covers certain areas including research. The inclusion of research varies in different programs. It can be one specific area or included as part of an area for accreditation. But regardless of the extent of its inclusion in the accreditation for different programs, research has to be pursued by the different units of the University at an accelerated manner. As the level of accreditation of a certain program gets higher, i.e. Level IV, the requirement for adequate research performance has to be substantiated. This is in the form of higher involvement of the faculty members in the research program and correspondingly better research outputs, quantity and quality wise. Performance in research does not end in the submission of final research reports but extends further to the publication of these research outputs in refereed international journals. If it takes some time to complete a research project, publishing a paper out of the research output will surely require more time. It should also be understood that submitting a paper for publication is not a guarantee that the paper will be published. The road to publication of research outputs in scholarly recognized journals is not a piece of cake. The bottom line is, no research output will get published if no research paper is submitted for publication and no research paper will be submitted for publication if no research project is conducted and completed.

Since there are no short cuts to all of these, any unit aspiring for higher levels of accreditation of their program should already encourage their faculty members to get involve in research and have their research outputs published in scholarly journals so that by the time they get invited for higher level of accreditation, like Level IV, they are already prepared to comply with the necessary research requirements.

This is easier said than done. In order for the faculty to be involved in research and prepare a research paper for publication, they have to find time to do research. This will have some implications in their teaching and other loads and incentives given to encourage them to do research. The University through the University Research Center is now finalizing the guidelines for the conduct of research and publication of research papers which among other things include provisions for incentives on the above concerns. With the new guidelines and set of better incentives, it is expected that more faculty members will be involved in research as well as prepare research papers for publication. This will mean greater involvement of faculty in research, more research outputs and more research papers submitted for publication and published.