



43rd Annual Report

Taufik
EPI Director

2013-2014

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LETTER FROM DIRECTOR

Dear Friends,

It is my pleasure to present once again this annual report on behalf of the Electric Power Institute at Cal Poly State University.

EPI has the mission to develop the best possible educational research and service in the area of power and energy systems, power quality, renewable and sustainable energy and power electronics. The EPI faculty initiates and carries out an expanded program of senior and graduate student research projects of a basic and widely applicable nature with the support of the program funds provided by the sponsors.

The resources of the Electric Power Institute (EPI) enhance the strong reputation of excellence that the Electrical Engineering Program at Cal Poly has maintained. The faculty, students, and the power program have also benefited from the continued work of EPI and the financial support it receives from the power industry.

This past year we've continued our focus on pursuing research activities in several key areas including renewable energy, power system protection, and smart grid which encompasses cyber security. Renewable energy has become critical especially in California where the state has mandated that 33% of electric power generated has to come from renewable energy sources by the year 2020. Our focus on this area has resulted for examples in the development of Sustainable Energy lab funded by San Diego Gas and Electric, and research activity to develop DC House technologies sponsored by Electronic Control Systems, Chevron, and California Energy Commission (CEC). EPI will also continue the effort on smart grid and cyber security as these areas have received a lot of attention within Cal Poly as well as nationally. Last year, EPI received another sponsorship from San Diego Gas and Electric to conduct a research project on condition-based maintenance system for power transformer. EPI also received equipment donation from International Rectifier and San Diego Gas and Electric that enhances power lab's ability in conducting research in the area of power engineering. As in the past years, last year we conducted several power system and power electronics related presentations where engineers from these industries visited and gave talk to our students and faculty.

We look forward to the coming year. With your ongoing support EPI will continue its active involvement with students, faculty, and the power industry. Please do not hesitate to get in touch with me if you have any questions or comments regarding this annual report. Thank you for your kind attention.

Sincerely yours,

A handwritten signature in black ink, appearing to be 'Dr. Taufik', written over a faint, stylized star or geometric shape.

Dr. Taufik, Professor, Electrical Engineering Department

INTRODUCTION

In 1971, the university approved the release of a preliminary proposal, which outlined plans for the establishment of an Electric Power Institute. The proposal represented the culmination of many hours of effort by a small group of faculty in the Electrical Engineering Department. As stated in the proposal, the Electric Power Institute was established to serve as an interface between the university and the electric power industry, also serving as a center for electric-power-oriented activity within the university. The Institute also supports the administration of other projects in Electrical and Computer Engineering.

Throughout the Electric Power Institute's forty-two years of existence, many companies have supported its activities. This support comes in the form of financial contributions, conference sponsorships, workshop participation, seminar speakers, equipment donations, consulting opportunities for our faculty, and summer job opportunities for students and faculty.

We encourage our supporting companies to visit our campus and meet the faculty and administration, familiarizing themselves with our facilities. We find that these one-to-one visits strengthen our industrial ties, leading to a better understanding of the mutual needs of university and industry.

Each year of operation, the Institute has produced an annual report, this being our 43rd. This report is primarily a summary of the Institute's activities for the 2013-2014 academic year. A projection of activities and budget for the 2014-2015 academic year is also included in this report.

ORGANIZATION

The Electric Power Institute was the first institute to be formed at Cal Poly, making it necessary for the university to establish a set of operational guidelines to insure that the Institute's activities conformed to established university procedures. For example, funds contributed to the university must be accepted and disbursed in accordance with the rigid state laws and under the supervision of the Cal Poly Corporation.

As approved by the university, the leadership of the Institute is the responsibility of the director, who reports to the Dean of the College of Engineering. On a regular basis the director consults with the Advisory Committee, whose members are selected by the director of the Institute with the Dean's approval.

Director

Dr. Taufik, Electrical Engineering Department

Advisory Committee

Electrical Engineering Department

Dr. Ali Shaban, Electrical Engineering Department

Dr. Ahmad Nafisi, Electrical Engineering Department

Dr. Helen Yu, Electrical Engineering Department

Non-University

Mr. Laurence Abcede, Engineering Manager, San Diego Gas and Electric.

Members of the Electric Power Institute

Electrical Engineering Department

Dr. Bill Ahlgren

Dr. Dale Dolan

Dr. Helen Yu

Dr. Taufik

Dr. Ahmad Nafisi

Dr. Ali Shaban

San Diego Gas & Electric

Mr. Laurence Abcede

Administrative Assistant

2013 – 2014: Yuri Carrillo-Martines

INSTITUTE ACTIVITIES

1) Seminar Program

As part of the Electric Power Institute's continuing program to bring industry to campus, our seminar program brings individuals that are considered to be experts in their field to Cal Poly. Following are the seminars sponsored by EPI for 2013-2014:

- “LTSpice for Circuit Analysis and Simulation”, Dave Green and Glen Fabian, Linear Technology, March 1, 2014.



- “Engineering and Security within an Electric Utility”, James Moralez P.E., San Diego Gas and Electric, April 10, 2014.



- “Community-Based Microhydro Power Plant”, Ani Parastiwi, Polytechnic State of Malang – Indonesia, November 14, 2013.

2) Publications

- [1]. Parastiwi, Taufik, “Microhydro for Rural Electrification as a Learn-By-Doing and Multidisciplinary Project: Lessons Learned”, ASEE PSW Conference, April 2014.

- [2]. Parastiwi, Taufik, "Experience from Faculty Exchange Program: Student Success Lesson from Cal Poly State University", ASEE PSW Conference, April 2014.
- [3]. D. Dolan, M. Ducasse, Taufik, "Variability in Detailed Energy Useage on Repeated Trips in the Chevrolet Volt", EVS27 27th International Electric Vehicle Symposium, Barcelona, Spain, November 2013.
- [4]. D. Dolan, J. Dunning, Taufik, "Analysis of Detailed Electric Vehicle Data in Electrical Engineering Education", EVS27 27th International Electric Vehicle Symposium, Barcelona, Spain, November 2013.
- [5]. D. Dolan, Taufik, "Characterizing Energy Usage of Chevrolet Volt Versus Speed", Proc. of SusTech, 2013.

3) Short Courses, Conference & Special Institute Attended

- [1]. "Getting Scholarships for Graduate Studies in the U.S.", Guest Lecturer, Universitas Bakrie, May 2013.
- [2]. "Recent Status and Challenges of the DC House Project for Rural Electrification", Guest Lecturer, Surya University, May 2013.
- [3]. "Recent Status and Challenges of the DC House Project for Rural Electrification", Guest Lecturer, Universitas Muhammadiyah Malang, May 2013.
- [4]. "Smart House for a Smarter Grid: An Electrical Engineering Perspective", Guest Lecturer, Politeknik Negeri Malang, May 2013.
- [5]. "Recent Status and Challenges of the DC House Project for Rural Electrification", Invited Speaker, Padjadjaran International Physics Symposium, May 2013.
- [6]. "DC House Project for Sustainable Rural Electrification", Panelist at the EBTKE Conference and Exhibition, Jakarta Convention Center, July 2012.
- [7]. "DC House Untuk Akses Listrik di Pedalaman dan Beasiswa Kuliah Di Amerika Serikat", Guest Lecturer, Universitas Trunojoyo Madura, July 2012.
- [8]. "DC House Untuk Akses Listrik di Pedalaman dan Pengalaman Studi di Amerika Serikat", Guest Lecturer, Universitas Brawijaya Malang, July 2012.
- [9]. "DC House Untuk Akses Listrik di Pedalaman", Panggung Inovasi, Ikatan Ilmuwan Indonesia Internasional, Aula RRI, July 2012.

4) Cash and Equipment Grants

- Equipment Donation, International Rectifiers, \$ 5k
- Total Alumni gifts \$ 13,227.29

5) Theses and Senior Projects

The following is a list of Master's theses funded by the Institute:

Jason Brinsfield	Modeling and Simulation of Parallel D-STATCOMs with Full-wave Rectifiers
Nicholas Weisser	Dual High-Voltage Power Supply for Use On Board a Cubesat
Michael Wu	Improvements to a Bidirectional Flyback DC-DC Converter for Battery System of the DC House Project
Kevin Mendoza	Smart Wall Outlet Design and Implementation for the DC House Project

The following is a list of Senior Projects funded partially by the Institute:

James Biggs and Andrew Aw	Design of Portable Nano-Hydro Power Generator
Haoyan Huang and Cory Yee	Design of Improved Smart DC Wall Plug for the DC House Project
Sal Navaro and Sarah Ashe	Design of Improved Merry-Go-Round Human Powered Generator for the DC House Project
Brandon Wong, Danny Cai, Tim Lai	Design of Improved Swing Human Powered Generator for the DC House Project
Scott Chau and Kevin Gingrich	Integration of PV and Simulated DC Sources for the DC House Project
Xin Chen and Ryan Harada	Design of a PWM Inverter Circuit for Power Electronics Lab
Philip Yu and Stephen Leung	High Voltage Pulse-Width Generator for the Algae Biofuel Project
Caleb Fink, Victor Ojewole, Chris Tan	Portable Nano-Hydro Power Generator System for the DC House Project
Jacob Michener and Anthony Llyod	Ventilation Wind Turbine Generator

6) Club Activities

Professor Dolan is the advisor for the Cal Poly Chapter of the Power and Energy Society (PES). Scott Chau was the president of the Power and Energy Society during 2013-2014. The club holds bimonthly meetings, arranges industry field trips, and brings in industry speakers for seminars. They made field trips to Pacific Gas & Electric and San Diego Gas and Electric Company. They arranged info sessions for companies offering summer internships and employment. EPI has contributed to the Power Engineering Society Club activities.

INSTITUTE PLANS

Much of the work of the Institute were completed in AY13-14 with some are still ongoing and will continue in its present form. Specific plans for the upcoming year are indicated below:

1. **Power Engineering Conference and Seminars**

EPI continues to sponsor the annual power conference at Cal Poly and professional seminars for students and faculty on various topics of power engineering. Seminars will be held once each quarter during the normal academic year. Guest seminar speakers will be invited from sponsoring companies and the power industry in general. Whenever possible, we seek to include Cal Poly alumni who have been working in the field for several years. These speakers provide special insight for current Cal Poly students.

2. **Sustainable Energy Laboratory.**

The Institute will continue to support the development of Sustainable Energy Laboratory located in 20-150.

3. **Professional Development**

As part of our continuing effort in the area of professional development, the Institute supports faculty attendance at short courses, special institutes, and conferences.

4. **Student Projects**

EPI continues to support senior projects, master theses, and research efforts related to power systems and power electronics.

5. **Financial Support**

We will continue to solicit support for the Institute from the power industry. Support will be requested for both the ongoing program of the Institute and for assistantships for graduate students and senior projects.

FINANCIAL STATEMENT

The following financial statement is a reflection of the 2013-2014 operating statement of EPI as provided by the Cal Poly Foundation:

BEGINNING BALANCE		83,787.99
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INCOME	Income (Gifts)	13,227.29
	TOTAL INCOME	13,227.29
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EXPENSES	Operational Expense	1,984.90
	Sustainable Energy Lab	4,066.15
	Power Electronic Lab	262.25
	Power Electronic Project	4,677.87
	Meetings	186.39
	SDGE Smart Grid	2,246.30
	Travel Expense	409.16
	TOTAL EXPENSES	13,932.74
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REMAINING BALANCE		82,896.15
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PROJECTED BUDGET FOR AY 2014-2015

INCOME	Industry and Individual Gifts	25,000.00
	TOTAL INCOME	25,000.00
EXPENSES	Administrative Support Services	2,000.00
	Benefits	500.00
	Operational Expenses	3,000.00
	Project Equipment	10,000.00
	Travel Expenses	3,000.00
	Seminar/Short Courses	3,000.00
	SUBTOTAL	21,500.00
	Corporation Fiscal Charges	1,000.00
	TOTAL EXPENSES	22,500.00