44th Annual Report

Taufik
EPI Director

2014-2015

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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. One technology to support the utilization of renewable energy is the inverter technology. Last year we participated in the Google's Little Box Challenge where a team of electrical engineering students and a faculty advisor developed a high-density inverter for use in solar panel applications. The project received financial support both from companies and Cal Poly. Our research on the DC House Project has also gained more tractions last year with DC House prototype built at Universitas Padjadjaran Indonesia, and in December 2015 another prototype will be constructed in the Philippines. 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. EPI also received equipment donation from International Rectifier 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,

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 44th. This report is primarily a summary of the Institute's activities for the 2014-2015 academic year. A projection of activities and budget for the 2015-2016 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

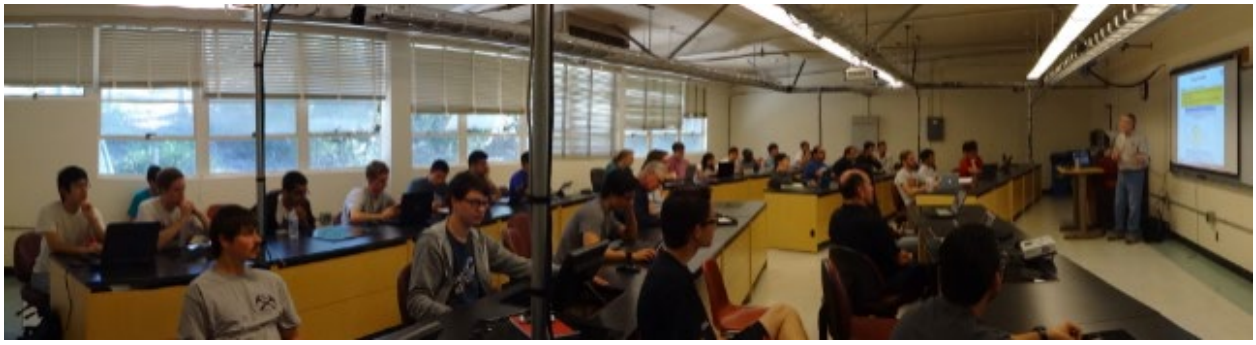
2014 – 2015: Kyle Tom

INSTITUTE ACTIVITIES

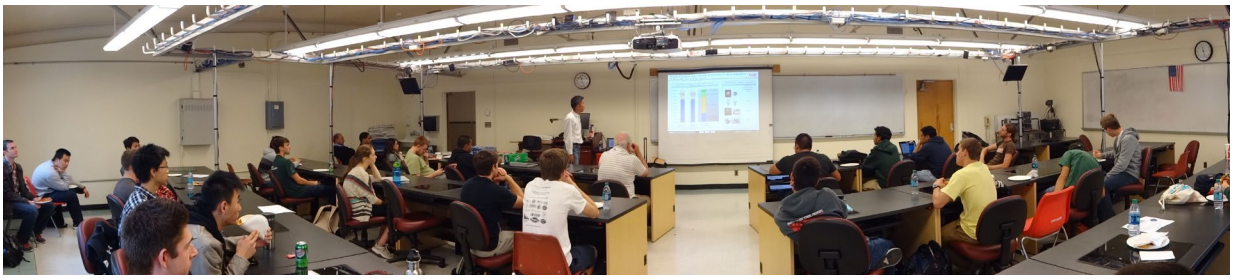
1) Seminar Program

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 7, 2015, Building 20-136. A total of 32 students attended the seminar.

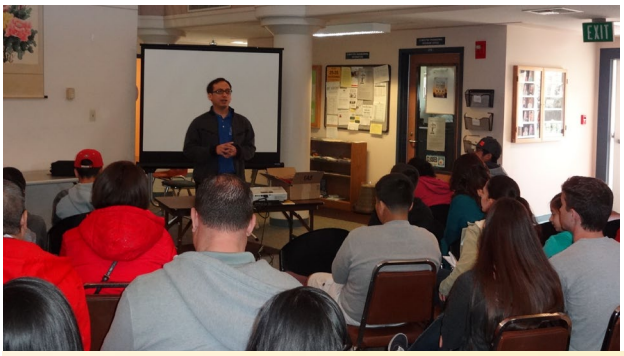
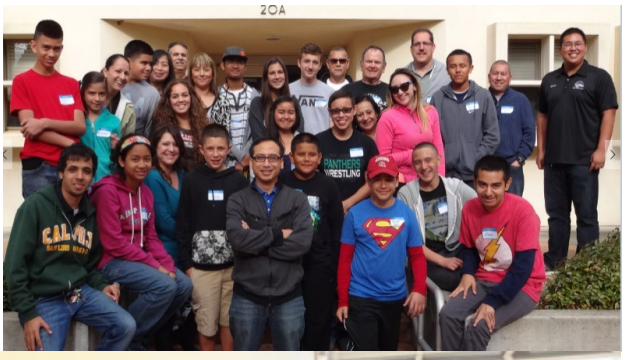
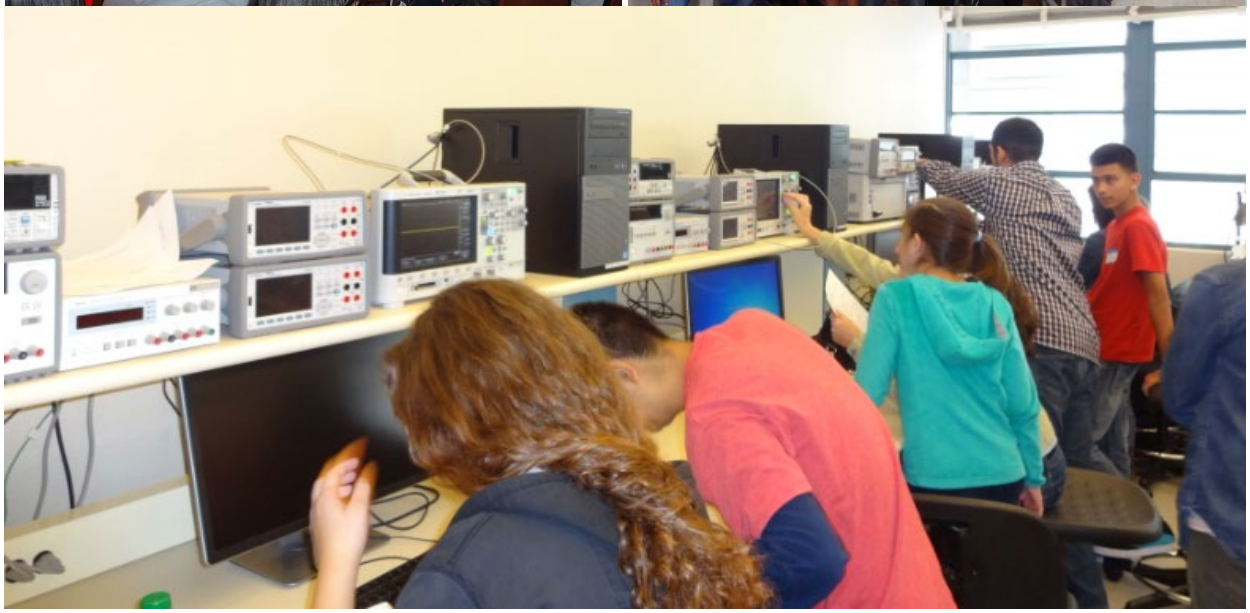


- "Automotive Power Electronics", Wibawa Chou, International Rectifier, 11/20/14, Building 20-136. Attended by 32 students and faculty.



2) Outreach Event

- **EPI Power Day for Pioneer Valley High School Students and Parents**
  - Attended by a total of 26 students and their parents
  - Hosted an info session about electrical engineering in general and the electrical engineering department at Cal Poly
  - Gave a tour to electrical engineering laboratories
  - Conducted fun learning electrical engineering laboratory demonstration and experiments

3) Publications

- S. Westdal, K. Mendoza, Taufik, A. Parastiwi, "Calculating Frequency and Max Duty Cycle for the TI UCC38C4X Family PWM Controllers", 2015 National Seminar on Information Technology and Its Applications, June 2015.
- D. Dolan, V. Prodanov, Taufik, "Energy and Economic Losses due to Soiling on Utility Scale PV Systems to Guide Timing of Cost Effective Cleaning", 42th IEEE Photovoltaic Specialist Conference, New Orleans, June 2015.
- S. Westdal, K. Mendoza, Taufik, A. Parastiwi, "Calculating Frequency and Max Duty Cycle for the TI UCC38C4X Family PWM Controllers", National Seminar on Information Technology and Its Application, Indonesia, June 2015.
- Taufik, D. Dolan, "Work-In-Progress: Enhancing Students' Learning in Advanced Power Electronic Course Using a USB Solar Charger Project", ASEE PSW Conference, April 2015.
- A. Bakar, M. Wahyu, Taufik, S. Aizam, Jumadrill, "Design Study of Zero Voltage Switching for DC/DC Boost Converter", Ninth International Power Engineering and Optimization Conference, March 2015.
- A. Afarulrazi, M. Wahyu, Taufik, S. Aizam, M. Yonis, "Design of Analog to Digital Converter for DC to DC Boost Converter with Constant Output Voltage", Third

International Conference on Computer Engineering and Mathematical Sciences, December 2014.

- Taufik, “The DC House Project: An Alternate Solution for Rural Electrification”, IEEE Global Humanitarian Technology Conference, October 2014.
- D. Dolan, Taufik, M. Ducasse, "Quantifying Variability in Detailed Energy Useage on Repeated Trips in the Chevrolet Volt", 2013 World Electric Vehicle Symposium and Exhibition, EVS 2014, October 2014.

4) Short Courses, Conference & Special Institute Attended

- "Pengelolaan dan Pengembangan Laboratorium Sebagai Pusat Riset Terapan Yang Berkelanjutan", Guest Speaker, Politeknik Negeri Semarang, Indonesia, July 2015
- "The DC House Project: An Alternate Solution to Rural Electrification", Guest Speaker, Universitas Dian Nuswantoro, Indonesia, July 2015.
- "The DC House Project: An Alternate Solution to Rural Electrification", Guest Speaker, Institut Teknologi Surabaya, Indonesia, July 2015.
- "A Discussion of Potential Collaboration Between Cal Poly and PENS", Guest Speaker, Politeknik Negeri Surabaya, Indonesia, July 2015.
- "The DC House Project: An Alternate Solution to Rural Electrification", Guest Speaker, Universitas Bhayangkara, Indonesia, July 2015.
- "The DC House Project: An Alternate Solution to Rural Electrification", Guest Speaker, Universitas Islam 45, Indonesia, June 2015.
- "The DC House Project: An Alternate Solution to Rural Electrification", Guest Speaker, Universitas Negeri Jember, Indonesia, June 2015.
- "Toward an ABET Accredited Electrical Engineering Curriculum", Guest Speaker, Universitas Padjadjaran, Bandung, Indonesia, April 2015.
- "Cal Poly at a Glance" and "The DC House Project: An Alternate Solution to Rural Electrification", Guest Lecturer, Universitas Sultan Ageng Tirtayasa, Indonesia, April 2015.
- A Discussion on Engineering Curriculum, Universitas Prof. Dr. Moestopo (Beragama), Jakarta, Indonesia, April 2015.
- "Cal Poly at a Glance" and "The DC House Project: An Alternate Solution to Rural Electrification", Guest Speaker, Universitas Borneo Tarakan, Indonesia, April 2015.
- "DC Electricity: Technology of the Past and the Future", Guest Speaker, Universitas Muhammadiyah Sidoarjo, Indonesia, April 2015.
- "DC Electricity: Technology of the Past and the Future", Guest Speaker, Universitas Muhammadiyah Malang, Indonesia, April 2015.
- "DC Electricity: Technology of the Past and the Future", Guest Speaker, Politeknik Negeri Malang, Indonesia, April 2015.
- "Writing for Publication in International Journals", Guest Speaker, Electrical Engineering Department, Universitas Brawijaya Malang, Indonesia, April 2015.
- "The DC House Project: An Alternate Solution to Rural Electrification", Guest Speaker, Politeknik Negeri Ujung Pandang, Indonesia, April 2015.
- "DC Electricity: Technology of the Past and the Future", Guest Speaker, Technological Institute of the Philippines, April 2015.

- "Design of Practical Buck Converter", Guest Lecturer, Technological Institute of the Philippines, April 2015.
- "The DC House Project: An Alternate Solution to Rural Electrification", Guest Speaker, Technological Institute of the Philippines, April 2015.
- "The DC House Project: An Alternate Solution to Rural Electrification", Guest Speaker, Universitas Muhammadiyah Tangerang, Indonesia, April 2015.
- "Cal Poly at a Glance" and "The DC House Project: An Alternate Solution to Rural Electrification", Guest Speaker, Universitas Jendral Soedirman, Indonesia, April 2015.
- "Powering Future Microprocessor", Guest Speaker, ST3 Telkom, Purwekerto, Indonesia, April 2015.
- "DC Electricity: Technology of the Past and the Future", Guest Lecturer, Telkom University, Bandung, Indonesia, April 2015.
- "DC Electricity: Technology of the Past and the Future", Guest Lecturer, Universitas Padjadjaran, Bandung, Indonesia, April 2015.

5) Cash and Equipment Grants

- Equipment Donation, International Rectifiers (IGBT Modules and Power Supplies), $7k
- Total Alumni gifts $ 3,514.80

6) MS Theses

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

Brian Lin	A Low Cost Loop Measurement Tool for DC-DC Converters
Marc Haeberlin	Adaptive Automotive Lighting System

7) Club Activities

Professor Dolan is the advisor for the Cal Poly Chapter of the Power and Energy Society (PES). Taylor McClain was the president of the Power and Energy Society during 2014-2015. 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 Seminars

EPI continues to host and sponsor 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 2014-2015 operating statement of EPI as provided by the Cal Poly Foundation:

BEGINNING BALANCE			**82,896.15**
INCOME	Donation – Companies	33,000.00	
	Donation – Individuals	3,514.80	
	TOTAL INCOME		**36,514.80**
EXPENSES	Operational Expense	5,001.17	
	Sustainable Energy Lab	350.00	
	Power Electronic Lab	3,239.38	
	Power Electronic Project	4,929.55	
	Meetings	97.84	
	Student Assistant Salary	2,854.14	
	Little Box Project	25,142.72	
	Travel Expense	285.35	
	TOTAL EXPENSES		**41,900.15**
REMAINING BALANCE			**77,510.80**

PROJECTED BUDGET FOR AY 2015-2016

INCOME	Industry and Individual Gifts	20,000.00
	TOTAL INCOME	**20,000.00**
EXPENSES	Administrative Support Services	2,000.00
	Benefits	500.00
	Operational Expenses	2,500.00
	Project Equipment	10,000.00
	Travel Expenses	2,000.00
	Seminar/Short Courses	3,000.00
	SUBTOTAL	20,000.00
	Corporation Fiscal Charges	1,000.00
	TOTAL EXPENSES	**21,000.00**