

ELECTRIC POWER INSTITUTE

California Polytechnic State University

San Luis Obispo, California

36th ANNUAL REPORT

Fall 2009

Submitted by:

Dr. Ahmad Nafisi
EPI Director

TABLE OF CONTENTS

LETTER FROM DIRECTOR	2
INTRODUCTION	3
ORGANIZATION	4
INSTITUTE ACTIVITIES	5
INSTITUTE PLANS	7
FINANCIAL STATEMENT	8
2009-2010 PROJECTED BUDGET	9

Dear Friends,

It is my delight to announce that once again we have experienced an increase in our power program. Last year, the industry need for power graduates and student participation in the program were both increased.

“US News and World Report” recognized Cal Poly as the best public, largely undergraduate university in the West for the 16th consecutive year. Cal Poly’s College of Engineering was named the No. 1 public engineering program in the nation in the magazine's Best Undergraduate Engineering Programs - for schools whose highest degree is a bachelor's or master's. Additionally, our Electrical Engineering Program ranked as the top program at a public university.

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.

Along with the existing *Electric Machinery Laboratory*, our *Power Electronics Laboratory* and related courses are being continually updated by Dr. Taufik to reflect recent innovations in this area.

A need for developing alternative energy resources is becoming more dire in the current global energy crisis. Sustainability of energy has become a necessity due to the combination of the rapid rate of industrial growth and environmental concerns. In this effort, we are pleased to inform you that through a generous gift from Sempra Energy we have been able to establish a Sustainable Energy Laboratory to compliment existing senior and graduate courses offered in these areas. Moreover, EPI members have significantly contributed in a DOE proposal: "Advanced Electric Drive Vehicle Education and Public Outreach Program" to establish a multidisciplinary concentration in electric drive system. The Electric Power Institute has sponsored senior projects and master thesis topics in sustainable energy and will continue to support research efforts in this area.

Through efforts of EPI members, in particular Dr. Ali Shaban, and generous donation from Operation Technology, Inc. (OTI), ETAP[®] Power System Simulation Laboratory is completed.

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. Ahmad Nafisi, Director, Electric Power Institute
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 Electronic and 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 thirty-three 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 36th. This report is primarily a summary of the Institute's activities for the 2008-2009 academic year. . A projection of activities and budget for the 2009-2010 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.

***** 2008-2009 *****

Director

Dr. Ahmad Nafisi, EE Department

Advisory Committee

EE Department

Dr. Ali Shaban, EE Department

Dr. Shyama Tandon, EE Department

Dr. James Harris, EE Department

Faculty at Large

Dr. Leonard Wall, Physics Department

Non-University

Mr. Mansour Pourcyrous, Vice President, Shaw Energy Delivery Services.

Members of the Electric Power Institute

EE Department

Dr. Bill Ahlgren

Dr. James G. Harris

Dr. Shyama Tandon

Dr. Saul Goldberg

Dr. Art MacCarley

Dr. Taufik

Dr. Ahmad Nafisi

Dr. Ali Shaban

Physics Department

Dr. Leonard Wall

Shaw Energy Delivery Services

Mr. Mansour Pourcyrous.

Administrative Assistant

Vincent Bottoni

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 industry field to Cal Poly. Following are the seminars sponsored by EPI for 2006-2007:

February 21, 2009

Power Quality
Stacey Williams and Sneha Parmar
San Diego Gas and Electric

May 9, 2009

Advances in Power System Protection (Sponsored jointly by PES and EPI)
Mike Jensen, Davis Ervin, and Rafel Pineda
Pacific Gas and Electric

2) **Short Courses**

A short course on “Power System Protection” was offered in Dec 2008. The short course was given by Professor Ali Shaban.

3) **Publications**

Taufik, E. Schaefer, M. Anwari, and M. Taufik, “Performance Analysis of Shunt Reactive Power Compensators”, Proceedings of the Asia Modeling Symposium, May 2009, *to appear*.

[2]. Taufik, A. Oi, M. Anwari, and M. Taufik, “Modeling and Simulation of Photovoltaic Water Pumping System”, Proceedings of the Asia Modeling Symposium, May 2009, *to appear*.

[3]. Taufik, B. Butterfield, M. Anwari, and M. Taufik, “Modeling and Simulation of Multiple-Input Converter System with Equally Drawn Source Power”, Proceedings of the Asia Modeling Symposium, May 2009, *to appear*.

[4]. M. Anwari, M. Hamid and Taufik, “Modeling and Simulation of a Network of Adjustable Speed Drives”, Proceedings of the 3rd International Conference on Modeling, Simulation, and Applied Optimization, January 2009.

[5]. M. Anwari, M. Hamid and Taufik, “Modeling and Simulation of Multi-pulse Rectifier Connected to Adjustable Speed Drive”, Proceedings of the 3rd International Conference on Modeling, Simulation, and Applied Optimization, January 2009.

[6]. Taufik, E. Matsumoto, and M. Anwari, “Impact of Multiple Adjustable Speed Drive System to Power System Harmonics”, Proceedings of the 2008 Power Engineering Conference, December 2008.

- [7]. Taufik and B. Paet, “A Small Scale Static VAR Compensator Experiment”, Proceedings of the 2008 Power Engineering Conference, December 2008.
- [8]. M. Hamid, M. Anwari, Taufik, and Zainal Salam, “Load Sharing Characteristic of Single-Phase PV Inverter Connected to Grid”, Proceedings of the 2008 Power Engineering Conference, December 2008.
- [9]. M. Anwari, M. Hamid, and Taufik, “Power Quality Behavior of Single-Phase Fed Adjustable Speed Drive from Grid of PV Generation”, Proceedings of the 2008 Power Engineering Conference, December 2008

4) **Short Courses, Conferences, & Special Institutes Attended:**

Dr. Taufik presented a tutorial “Practical Design of Buck Converter”, at the 2008 IEEE Power Engineering Conference, Johor Bahru, Malaysia, December 2008. He also presented “Power Program at Cal Poly, San Luis Obispo”, Helix Electric, San Diego, July 2008 and One-Day Workshop on “Practical DC-DC Converter Design”, IEEE Power Electronics Chapter of Malaysia Section, July 2007.

5) **Cash and Equipment Grants**

Sustainable Energy Laboratory Grant, Sempra Energy, \$65,000.
 Power Electronic Laboratory Development Grant, Enerpro, Inc., \$10,000.
 Power System Simulation, Operation Technology, Inc. (OTI), 35 copies of professional version of ETAP® simulation program, \$400,000.
 Advantage
 Fitness Products, Commercial Elliptical Fitness cross trainer, \$6895.00

6) **Summer and Permanent Job Program**

EPI seeks and assists students in acquiring summer and full-time positions whenever possible.

7) **Club Activities**

Professor Taufik is the advisor for the Cal Poly Chapter of the Power and Energy Society (PES). Vincent Bottoni was president of the Power and Energy Society during 2008-2009. The club holds bimonthly meetings, arranges industry field trips, and brings in industry speakers for seminars. They made a field trips to Conoco Phillips Refinery and organized a presentation on Smart Meters by 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 is ongoing and will continue in its present form. Specific plans for the upcoming year are indicated below:

1. **Power Engineering Seminars**

EPI continues to 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. **ETAP Power simulation Laboratory.**

Electrical engineering department has allocated and funded a laboratory space (20-144) for *Power System Simulations* Laboratory for which we have received 35 ETAP® professional level simulation programs.

3. **Sustainable Energy Laboratory.**

Electrical engineering department has allocated laboratory space (20-150) for Sustainable Energy Laboratory. College of Engineering and Electrical Engineering Department have provided funds to upgrade the room. A \$65,000 donation from Sempra Energy will be used for laboratory equipment.

4. **College of Engineering Project Based Learning**

The Electric Power Institute members participate and contribute in the College of Engineering Project Based Learning initiative.

5. **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.

6. **Sustainable Engineering**

EPI continues to support senior projects, master theses, and research efforts related to sustainable energy. EPI members are submitting proposals to establish a renewable energy center at Cal Poly.

7. **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.

FINANCIAL STATEMENT

The following financial statement for June 30, 2009
is a reflection of the 2008-2009 operating statement prepared for EPI by the Cal Poly
Foundation:

INCOME	Income	76600
	TOTAL INCOME	76600
EXPENSES	Institute Director	1076
	Administrator/Support Services	480
	Payroll Taxes and Workers Comp	105
	Project Equipment (power electronic projects)	1930
	Operational Expense	562
	TOTAL EXPENSES	4154

Electric Power Institute - Projected Budget for 2009-2010 Academic Year

INCOME	Industry Support	50,000.00
	TOTAL INCOME	50,000.00
EXPENSES	Institute Director	1,000.00
	Administrative Support Services	2,000.00
	Benefits	600.00
	Operational Expenses	500.00
	Project Equipment	65,000.00
	Faculty Travel	2,400.00
	Seminar/Short Courses	1,000.00
	Scholarships	500.00
	SUBTOTAL	73,000.00
	Corporation Fiscal Charges	600.00
	TOTAL EXPENSES	73,600.00