



POWER  
ENGINEERING EXCELLENCE  
TRUST

# Annual Report 2014



# Chairman's Statement

The University of Canterbury (UC) has a history of excellence in Electric Power Engineering (EPE), dating back to the establishment of the College of Engineering, the leadership of the late Professor Jos Arrillaga, followed by Emeritus Professor Pat Bodger. Building on this foundation of excellence, the Power Engineering Excellence Trust (PEET) and the EPECentre were established to continue to promote the excellence in EPE education, and to develop a strong relationship with the electricity industry. The EPECentre has been successful in promoting EPE and PEET's mission, with a peak in the number of students taking the final year Power Systems and Machines courses in 2013.

Since 2002, PEET members from the electricity industry have contributed a total of \$3 million to PEET. This has enabled the following achievements:

- Over 126 undergraduate and 26 postgraduate scholarships provided to students specialising in EPE, increasing the popularity of the EPE specialisation and high achieving young engineers moving into industry;
- Greater interaction between academia and industry – for example field trips to our members' sites and events such as the Careers Convention and R&D Expo;
- Provision of modern laboratory resources including the machines laboratory;
- Funding for EPECentre and a 50% contribution to High Voltage (HV) Laboratory personnel – details of achievements resulting from this are covered in the HV lab article later in this report.
- Development of learning resources for schools nationwide and hosting schools to increase awareness and skills in electrical systems and raise interest in EPE careers.

Our changing world has meant the introduction of new engineering degree disciplines that specialise in fields such as Mechatronics and Computer Engineering. Introduction of new disciplines, combined with the 2010/11 Canterbury earthquakes led to fewer students entering the Electrical and Electronic Engineering (EEE) degree programme. This was followed by fewer students enrolling in final year EPE courses in subsequent years. Declining student enrolments into EEE degree mean a reduction in the number of students enrolled into EPE courses in following years and an inevitable reduction in EPE courses and EPE academics at UC. This highlights the paramount importance of PEET in order to sustain excellence in EPE education and our future power engineers. PEET is currently working with UC and considering options to sustain EPE capability at UC.

Our changing world also means an increased need for electric power engineers, to, for example, deal with new technology in the distribution networks such as small scale distributed generation, storage, and electric

vehicles. Because of this, the above challenges are of the utmost priority to PEET and UC. In order to deal with the challenge of falling enrolments into EEE, the EPECentre launched a new scholarship scheme in 2014, the UC Electric Power Engineering Centre Scholarship. Taking effect in 2015, this scheme provides eight \$15,000 scholarships to school leavers pursuing EEE degrees at UC. The purpose of the scheme is: (1) to promote the EEE degree at UC; (2) promote EPE as a career; (3) attract and recruit the top students to EEE and EPE; and (4) to support students throughout their EEE degrees. The Trustees recognise the huge investment required by students to undertake an engineering degree, and have a vision of supporting more students through their degrees by offering more scholarships.

Following the 2010/11 Canterbury earthquakes, UC is currently refurbishing its College of Engineering. EEE students entering into the degree programme in 2016 will have access to brand new lecture theatres, and facilities including 'Machines' and 'Smart Power' laboratories. This will enable EPECentre to host its outreach programmes to schools in brand new facilities, and promote state of the art learning environment to schools. Some of the new facilities in the new labs have been enabled by the GREEN Grid programme.

The EPECentre's reputation continues to grow with the GREEN Grid and Joule Log heating research programmes. GREEN Grid continues to engage the industry, through the technical Network Analysis Group which comprises of industry and academic representatives, in order to understand and provide solutions to the challenges surrounding Renewable Energy and the Smart Grid in a New Zealand context. GREEN Grid has delivered several research papers in 2014, such as the "Low Voltage Network Modelling" that offer solutions of direct importance to our industry through the EEA and GREEN Grid conferences. It has also brought the industry together to provide a submission to Standards Australia on the draft joint Australia and New Zealand standard for the connection of small scale distributed generation to the grid. GREEN Grid will also help the EPECentre staff teach into EEE courses and transfer world leading knowledge onto our future engineers who are entering into a rapidly changing industry that has to deal with the effects of small scale distributed generation uptake, renewable energy targets and the implementation of smart technologies.

The EPECentre's research programmes continue to raise the profile of the EEE degree and EPE discipline, and provide postgraduate and summer research scholarship opportunities to students. The EPECentre awarded a total of 20 scholarships (10 undergraduate, 6 summer research, and 4 postgraduate) to students in 2014.

I would like to thank our industry members for their support and funding of the Trust. The value the EPECentre provides to sustain excellence in EPE education and the industry through its research programmes highlight the commitment and dedication of Dr Allan Miller, the EPECentre Director, and his team. I would also like to thank my fellow trustees and Professor Jan Evans-Freeman, Pro Vice-Chancellor, College of Engineering for their support, commitment and wise counsel.

I encourage and welcome the industry to join us and invest in PEET/EPECentre. This is a unique partnership, which is paramount to sustain the excellence of EPE education and professional engineering capability for our industry.

#### Peter Berry

Chair, Power Engineering Excellence Trust/Electric Power Engineering Centre

**The trustees for 2014 were:** Peter Berry (Chair & professional engineering representative), John Foote (generation), Professor Pat Bodger (academia), Gavan Jackson<sup>1</sup> (contracting), Richard Aitken<sup>1</sup> (consulting), Bob Simpson<sup>1</sup> (transmission), Tas Scott (distribution), Sean McCready (executive assistant to the Trust), Valerie Lang (secretary to the trust). The PEET Trust met four times during the year and did not receive any remuneration in our capacity as Trustees.

<sup>1</sup> Following their long service to PEET, Gavan Jackson, Robert Ferris and Richard Aitken nominated an alternative representative for each of their sectors.

## 2014 Highlights Education

- 10 Undergraduate scholarships were awarded to EPE students
- 8 New UC EPECentre scholarships were awarded to school leavers
- 27 students participated in each of the South and North Island field trips to power stations, substations / switchyards, and control centres owned by PEET members
- 500 secondary schools students were hosted at UC for EPE laboratory demonstrations

## Industry – Academia Interaction, and Research

- EPECentre Careers Convention enabled PEET members to promote and recruit EPE graduates
- EPECentre R&D expo enabled final year and postgraduate EPE students to present their research to PEET members' senior engineers and executives.
- Greater interaction between industry and academia was achieved through GREEN Grid research.
- Six topical conference (EEA) papers of interest to our industry were presented at the EEA. One journal (IET) paper was submitted.

## HV Laboratory

Established in the early 1960s, the UC High Voltage (HV) laboratory is primarily used to carry out leading Electric Power Engineering (EPE) research and teaching of undergraduate EEE students through laboratories. It occasionally undertakes a secondary role providing prototype or equipment condition assessment testing services to industry.

In 2013, following a period of HV lab's uncertainty partly due to funding constraints, PEET commenced co-funding the HV technician's salary in order to maintain UC's excellence in HV and EPE education. In 2013/14, through PEET's support, the HV laboratory has enabled: (1) over 1,000 secondary school students to learn about the HV and EPE; (2) HV lab workshops teaching over 600 undergraduate students in an industry aligned safety controlled environment; (3) five final year undergraduate and five postgraduate students' EPE research; and (4) nine companies to carry out specialist tests and projects.

Research in the HV laboratory is geared towards understanding electric field and high voltage phenomena, and developing new technologies which use high voltage concepts in their design. Current examples of such research include:

1. EPECentre research using HV in place of methyl bromide, an environmentally hazardous substance, to treat logs for export via joule heating of the log.
2. EPECentre postgraduate scholar Yanosh Irani's research into cascaded partial core transformer (PCT) technology. Yanosh aims to reach 100kV at 0.3uF from resin impregnated windings (no oil).
3. Three phase transduction water heating.
4. Final year research projects by UC Rocketry that aims to launch rockets into space from a HV capacitor charged coil gun.

Teaching EPE undergraduate students in the HV laboratory includes laboratories to study dielectric breakdown under varying atmospheric conditions, supply voltage and frequency. Through laboratories, students are also taught to measure and assess the condition of transformer insulation and earthing using state of the art equipment

The laboratory is managed by Dr Andrew Laphorn, academic responsible for the laboratory, and Mr. Paul Agger, HV laboratory technician. The HV laboratory team retains its industry experience through regular on-site industry engagement and by maintaining applicable industry certifications and practising licence. The HV team provides best practice "safety by education" to students working in the HV laboratory where students learn to follow best industry practice in a controlled environment.

# **Financial Statements**

## **For the year ended 31 December, 2014**

### **Statement of accounting policies**

The Power Engineering Excellence Trust is a charitable trust established in 2002. The Objects of the trust are:

- Encourage a greater number of students to study power engineering, thus increasing the quantity and quality of power engineers in New Zealand.
- Maintain, enhance and sustain research into, and the study of, power engineering.
- Create closer, stronger and synergistic relationships between students of power engineering and the power industry.
- Provide for and foster power engineering innovation as a product of education.
- Provide better awareness of the existence and benefits of the Department's power engineering courses to the power industry.

#### **General accounting policies**

These Financial Statements have been prepared in accordance with the Financial Reporting Standards and Statements of Standard Accounting Practice issued by the New Zealand Institute of Chartered Accountants. In September 2007, the Accounting Standards Review Board decided that mandatory adoption of International Financial Reporting Standards (NZ IFRS) should be delayed for some small organisations. The Power Engineering Excellence Trust falls into the category of organisations that can delay the adoption of NZ IFRS and so are permitted to continue applying New Zealand Financial Reporting Standards and Statements of Standard Accounting Practice.

The Power Engineering Excellence Trust are deemed a qualifying entity within the Framework for Differential Reporting, on the basis that they are not publicly accountable and are not large. As such, the Power Engineering Excellence Trust has taken advantage of all differential reporting concessions available to them except for FRS19 Accounting for Goods and Services Tax and FRS10 on Cash Flows, with which they have complied fully.

The general policies adopted in the preparation of these financial statements are the measurement and reporting of financial performance and position on an historical cost basis.

#### **Measurement base**

The general accounting policies adopted in the preparation of these financial statements for the measurement and reporting of financial performance and position are on a historical cost basis adjusted by the revaluation of certain assets.

#### **Accounting policies**

The following are the particular accounting policies which have a material effect on the measurement of financial performance and the financial position.

#### **Investments**

All investments are stated at market value. Foreign investments have been translated to New Zealand currency at the ruling rates of exchange at balance date.

Investment income is calculated as per the Statement of Investment Objectives, which is approved by University Council. This provides for a 4.5% operating return and two further distributions to equity, which maintain the purchasing power and also allow for future market fluctuations.

#### **Accounts receivable**

Accounts receivable are recorded at expected realisable value; where a debt is considered unrecoverable it is written off.

#### **Financial instruments**

Income and expenditure relating to all financial instruments are recognised in the Statement of Financial Performance. All financial instruments are recognised in the Statement of Financial Position.

#### **Foreign currencies**

Foreign currency transactions throughout the year have been translated to New Zealand currency at the ruling rates of exchange at date of payment. Realised and unrealised exchange gains or losses are accounted for in the Statement of Financial Performance.

#### **Goods and services tax**

All amounts are stated inclusive of Goods and Services Tax. As the University of Canterbury Trust Funds are not registered for GST, all GST is non-recoverable.

#### **Income**

##### **Investment Income**

Dividend income is recognised in the period the dividend is declared. Interest income is accounted for as it is earned.

##### **Expenditure**

Trust expenditure on scholarships, prizes and related travel is expensed/ accrued in the year that it is incurred.

#### **Taxation**

The University of Canterbury Trust Funds are exempt from the payment of income tax as it is a not-for-profit organisation registered under the Charities Act 2003. Accordingly, there is no provision for income tax.

#### **Changes in accounting policies**

There have been no changes in accounting policies. All accounting policies have been applied on a consistent basis with the previous year.

## STATEMENT OF FINANCIAL PERFORMANCE

For the Year Ended 31 December 2014	Note	31-Dec-14	31-Dec-13
Sundry Income	1	320,920	290,861
Investment Income	2	37,916	32,827
<b>Total Income</b>		<b>358,836</b>	<b>323,688</b>
<b>EXPENDITURE</b>			
Scholarships	3	75,000	111,750
Personnel		137,627	120,148
Power Engineering Education Support		—	1,606
Field Trips		24,453	13,150
Consulting		—	16,318
Sundry		34,451	—
<b>TOTAL EXPENDITURE</b>		<b>271,531</b>	<b>262,972</b>
<b>NET SURPLUS</b>		<b>87,305</b>	<b>60,716</b>

## STATEMENT OF MOVEMENTS IN EQUITY

For the Year Ended 31 DECEMBER 2014			
Balance as at 1 January		817,887	715,551
Net Surplus for period		87,305	60,716
Other Distributions	4	42,498	41,620
Total Recognised Income & Expenditure		<b>129,803</b>	<b>102,336</b>
Balance as at 31 December		<b>947,690</b>	<b>817,887</b>

## STATEMENT OF FINANCIAL POSITION

As at 31 DECEMBER 2014			
<b>CURRENT ASSETS</b>			
Sundry Debtors		—	—
<b>Total Current Assets</b>		<b>—</b>	<b>—</b>
<b>CURRENT LIABILITIES</b>			
Accounts Payable		—	—
<b>Total Current Liabilities</b>		<b>—</b>	<b>—</b>
<b>NON-CURRENT ASSETS</b>			
Investments	5	947,690	817,887
<b>Total Non-Current Assets</b>		<b>947,690</b>	<b>817,887</b>
<b>TOTAL NET ASSETS</b>		<b>947,690</b>	<b>817,887</b>
REPRESENTED BY:			
Trust Funds	6	947,690	817,887
<b>TOTAL TRUST FUNDS</b>		<b>947,690</b>	<b>817,887</b>
POWER ENGINEERING EXCELLENCE TRUST			

## NOTES TO THE FINANCIAL STATEMENTS

31 DECEMBER 2014		31-Dec-14	31-Dec-13
<b>1. Sundry Income</b>			
Industry Funding		286,187	245,249
Consulting Income		34,733	45,613
		<b>320,920</b>	<b>290,861</b>
<b>2. Investment Income</b>			
Investment Income Gain		37,916	32,827
		<b>37,916</b>	<b>32,827</b>
<b>3. Scholarships</b>			
Postgraduate		25,000	46,000
Undergraduate		50,000	55,000
Prior year scholarships		—	10,750
		<b>75,000</b>	<b>111,750</b>
<b>4. Other Distributions</b>			
CPI Adjustment to Base Capital		6,741	11,672
Revenue Reserve		35,757	29,948
		<b>42,498</b>	<b>41,620</b>

The investment gain for 2014 and 2013 was calculated at 4.5% on the average equity balance as per the Statement of Investment Policy Objectives, which is approved by University Council.

5. Investments		31-Dec-14	31-Dec-13
As at 31 December 2014 the amount of \$947,690 (2013: \$817,887) is invested through the University Trust Fund. Investment of these funds is overseen by investment advisers, Eriksen & Associates. This is in accordance with the Statement of Investment Policy and Objectives.			
<b>6. Trust Funds</b>			
Balance at beginning of period		817,887	715,551
Net Operating Surplus for period		87,305	60,716
Other Distributions		42,498	41,620
Balance at end of period		<b>947,690</b>	<b>817,887</b>
<b>7. Commitments</b>			
As at the balance sheet date, there were no commitments (2013: nil)			

The Base Capital adjustment is to maintain the purchasing power of the fund, spending this effectively reduces the capital of the fund. The Revenue Reserve is to be used as and when necessary, during years of low or negative investment returns, to support the flow of distributions without recourse to reducing the capital of the fund.

### 5. Investments

As at 31 December 2014 the amount of \$947,690 (2013: \$817,887) is invested through the University Trust Fund. Investment of these funds is overseen by investment advisers, Eriksen & Associates. This is in accordance with the Statement of Investment Policy and Objectives.

### 6. Trust Funds

Balance at beginning of period  
Net Operating Surplus for period  
Other Distributions  
Balance at end of period

### 7. Commitments

As at the balance sheet date, there were no commitments (2013: nil)

# Members

## Premium Members



## Members



Power and productivity  
for a better world™ **ABB**

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The EPECentre logo consists of a blue and yellow circular graphic next to the word "EPECentre" in a bold, black, sans-serif font, with the tagline "ELECTRIC POWER ENGINEERING CENTRE" in a smaller, black, sans-serif font below it.



UNIVERSITY OF  
CANTERBURY

*Te Whare Wananga o Waitaha*

CHRISTCHURCH NEW ZEALAND



"Promoting and supporting  
the education of power engineers  
and the study of power engineering  
as a field of excellence in New Zealand"