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The School of Engineering Edith Cowan University (ECU) strengthens renewable energy education with a Heliocentris Clean Energy Trainer

Case Study

ACADEMIA OFFERING

Client Profile: School of Engineering – ECU

ECU's School of Engineering is the fastest-growing engineering school in Australia with an annual growth of more than 20% in the last few years. The School enjoys some of the best-equipped hardware laboratories in the nation, with regular multi-million dollar investments into expanding and maintaining its world-class infrastructure.

Students benefit from programs specifically designed for the needs of Australian and Western Australian industrial corporations, most often covering engineering sciences with rigor and a strong emphasis on "hands on", practical learning experiences. Courses are offered across a wide range of engineering disciplines, for example:

- Chemical (commencing in 2013)
- Mechanical
- Electrical power
- Mechatronics
- Civil
- Automation & control
- Electronics & communications
- Computer systems

The School offers both a standard 4-year Bachelor of Engineering program and a 3+2 model comprising a 3-year Bachelor of Engineering Science program followed by a 2-year Master of Engineering.

These features, in addition to a committed and passionate team of academics, mean that the School of Engineering at ECU provides an exceptional environment for the education of graduates well-positioned to meet the current and future global challenges of their professions.

Client Request: Strengthen the Hands-On Renewable Energy Component of the Electrical Power Engineering Program

Heliocentris was approached as part of the School of Engineering's efforts to strengthen the infrastructure for supporting the renewable energy component of the Electrical Power Engineering Program course. The initiative was based on the prior successful collaboration with Heliocentris in regards to hydrogen technology.

Electrical Power Engineering is a relatively new engineering discipline at ECU, accredited in 2009. Graduates of the program are conversant in electrical and electronic engineering, have specialist skills in design, development and management of advanced and sustainable electrical power generation and transmission systems, and have the ability to participate in and lead complex multidisciplinary projects.

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AUSTRALIA ECU EDITH COWAN UNIVERSITY

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Electrical Power Engineering at ECU Encompasses:

- Renewable energy
- Electrical power generation
- Transmission and distribution
- Power electronics
- Electromechanical systems

The program focuses on the development of knowledge and skills relevant to professional engineering practice along with a sound theoretical base. Key professional and business skills include practical problem solving, teamwork and project development, thus ensuring students graduate with strong analytical skills and the ability to lead complex projects.

Within the Electrical Power Program , the course *ENS4445 Sustainability and Renewable Energy* introduces students to the concepts behind and the design of renewable and efficient electric power systems. Distributed power generation and its economics are discussed, followed by a detailed analysis of the design and operation of wind, photovoltaic, and other renewable power systems. Students are exposed to the problem of meeting energy demands while implementing strategies to reduce greenhouse gas emissions.

The Heliocentris Solution

Heliocentris provided the School of Engineering with seven sets of the Clean Energy Trainer (CET), which are set up in the newly established Renewable Energy Laboratory.

The CET is a hands-on hybrid renewable energy kit for introductory understanding of renewable energy technology and hybrid energy systems. Students can learn about many aspects of solar & wind energy, energy conversion, energy storage through electrolysis/hydrogen, fuel cells and hybrid renewable energy system design & management.

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The CET is very unique in comparison with what is offered in the market because it gives students an opportunity to experiment with a hybrid system and the relationships between the various technologies. It is the connection to our LabVIEW-based data analysis and simulation software that makes this kit powerful. The system is set up (dimensioned) and operated manually with options for simulation of weather conditions and energy usage (loads). The software allows for data collection of each component, and graphing of component characteristic curves (I/V Curves).

The School of Engineering opted for the Clean Energy Trainer since it specifically offers the hands-on experience related to the topics covered in the said unit.

Program Details & System Usage

The Clean Energy Trainer has been very useful in the teaching of Sustainability and Renewable Energy in the School of Engineering at ECU. The equipment was first used during the laboratory sessions for *ENS4445 Sustainability and Renewable Energy* in the second semester of 2012, with an enrollment of 14 students.

All experiments outlined in the Experiment Guide of the Clean Energy Trainer (i.e., solar energy, wind energy, electrolysis and fuel cells, renewable energy sources) have been performed by students during the laboratory sessions.

The feedback received from students was extremely positive. The experiments helped them understand the principles of solar cells, wind generators and fuel cells, the interrelationships of renewable energy sources and hydrogen, the conversion of different energy forms, and the dimensioning of various components of renewable energies. The approach represented by the Clean Energy Trainer made the theoretical principles comprehensible and encouraged their practical application.

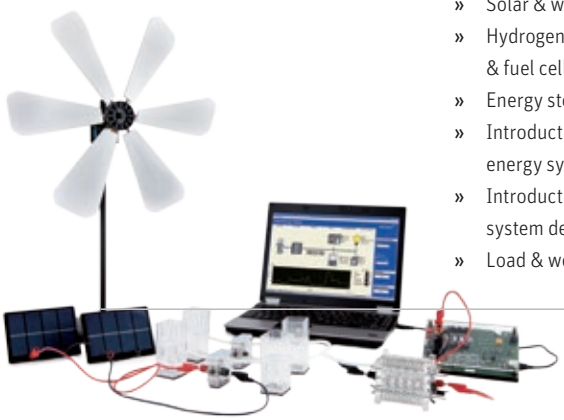
Final Thoughts

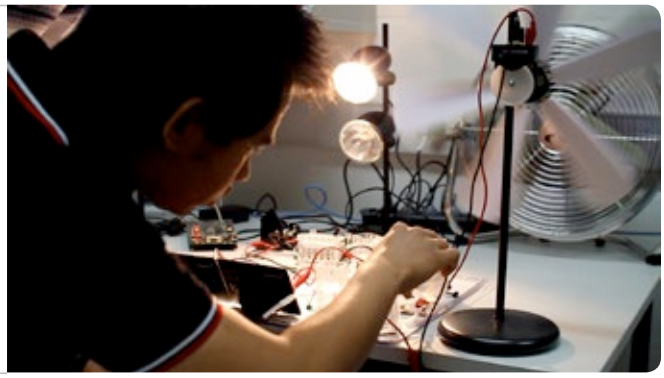
As a result of these systems, The School of Engineering has been able to better train their students in the fundamentals of renewable energy and hybrid renewable energy systems. The hands-on nature of the CET has given students the opportunity to put their fundamentals and problem-solving skills to the test.

Currently there are plans to expand the use of the Clean Energy Trainers beyond regular laboratory sessions. It was recently used in January 2013 for a high-school summer school to engage students in this new technology and encourage them to take the next step in their education, the student feedback received being very positive. There are also plans to use the CET for Final Year Projects, and some small-scale research related to renewable energy sources.

Clean Energy Trainer

- Solar & wind training
- Hydrogen (electrolysis) & fuel cell training
- Energy storage & conversion
- Introduction to hybrid renewable energy systems
- Introduction to renewable energy system design & management.
- Load & weather simulations





"The CET has been very useful in our teaching of sustainability and renewable energy. ...We plan to expand its use beyond regular laboratory sessions"

Dr. Octavian Bass, *Februar 7, 2013*

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