

## Executive Summaries

### 2009-2010 Bursary Vacation Placements in NSW

List of Executive Summaries		
Student	Company	Page
<b>2007 Bursary Holders</b>		
Boyan Bizoev	AEMO	3
Ashley Bruce	COUNTRY ENERGY	4
Zaher Charrouf	TRANSGRID	5
Bradley Benson	INTEGRAL ENERGY	6
Shaun Bartlett	TRANSGRID	7
Kevin Lee	JOHN HOLLAND	8
Rainer Scheurer	DELTA ELECTRICITY	9
<b>2008 Bursary Holders</b>		
Simon Varley	DELTA ELECTRICITY	10
Robert Alcaro	TRANSGRID	11
Daniel Watson	DELTA ELECTRICITY	13
Matthew Ley	TRANSGRID	14
Benjamin Kocal	INTEGRAL ENERGY	15
Joshua Spence	AEMO	16
Andrew Palummo	ENERGY AUSTRALIA	17
<b>2009 Bursary Holders</b>		
Alanna Vial	ENERGY AUSTRALIA	18
Anton Marinov	ENERGY AUSTRALIA	19
Christian Webb	ENERGY AUSTRALIA	20
Sam Shan Jiang	TRANSGRID	21

Mark Loneragan	TRANSGRID	22
Peter Cheetham	TRANSGRID	23
Michael Riordan	COUNTRY ENERGY	24
Mathew Lee	TRANSGRID	25



**STUDENT:**                    **Boyan Bizoev**

**COMPANY:**                **AUSTRALIAN ENERGY MARKET OPERATOR (AEMO)**

During the period 6th January 10 and 26th February 10 I was employed by the Australian Energy Market Operator (AEMO) as a vacation student, working in the Sydney Norwest office.

The following were my objectives for the work placement:

- To increase my understanding of electrical engineering principles
- To increase my knowledge of the national electricity market and its operation
- To improve my knowledge of power engineering including the associated challenges from the perspective of the company and department where I worked
- To successfully complete a project individually and without assistance

AEMO operates the National Electricity Market as well as the retail and wholesale gas markets of south eastern Australia. I worked in the Real Time Systems department, which develops and maintains systems and software incorporating real time power system and pricing data. This is important to ensure proper sale of electricity between generators and retailers and timely generation dispatch to meet electricity demand. The purpose of this report is to explain how the work objectives were achieved and to provide recommendations based on the outcomes.

The work placement involved two main tasks, with an overall objective to reduce contingency violations. A contingency violation shows potential equipment failure consequences. The first task involved the development of a data analysis tool to identify the most frequent violations so that these could be efficiently reduced first, and also to track the effectiveness of past reduction efforts using charts. I then looked at ways to improve the performance for large data amounts, including clustering non-essential information to improve retrieval time and efficiency.

The second task involved setting an expected severity value for the most frequent violations where lower severity occurrences will not be shown. The problematic violations below the expected severity value are not severe enough to justify action. A contingency violation should ideally be a reliable informant for needed action, where problematic violations can be detrimental by increasing the total violations and distracting the operator from other genuine violations.

Developing the analysis tool improved my Microsoft Access skills, gave me a good IT grounding and assisted in developing my project management skills through dealing with time constraints, and resolving unexpected performance and user interface objectives. I also gained knowledge about the practical measures in place to ensure a secure and reliable electricity supply.

Overall, the work placement at AEMO was an educational and valuable experience.

**STUDENT:** Ashley Bruce

**COMPANY:** Country Energy

During the summer of 09/10 I had the pleasure of working for Country Energy based at their main office in Port Macquarie. Over my 3 months I spent roughly equal time in Project management, Zone Substation Design and Sub Transmission Protection. Project management allowed me to see everything that goes into making a project work and how much behind the scenes work is needed to make it happen. The design section allowed me to get involved in a real project and showed me the challenges of working with such a big network and keeping it up-to-date and functioning. And finally the protection area allowed me to see the details of a system and how it all fits together. Overall my time at Country Energy allowed me to gain experience in a range of fields and provided valuable insights into Electricity Systems and Engineering.

In conclusion the time that I spent at Country Energy throughout the summer was very interesting and relevant to me and my degree. I have gained a great amount of experience and connections that I can take with me after my degree and use throughout my professional career. It has shown me the a great deal about the large networks in Australia and how they are constantly changing and evolving to overcome problems and grow with our nation. I was also able to gain insights into future directions in this industry that make this a very exciting time to be doing this.

Finally I would like to thank Country Energy and everyone there that contributed to making my time there so informative and enjoyable.



**STUDENT:** Zaher Charrouf Bizoev

**COMPANY:** TRANSGRID

I worked for TransGrid in the Network Development and Regulatory Affairs (ND&RA) group General Manager Peter McIntyre. I was working in the business unit of Regulatory Transmission Access (RTA), managed by Philip Gall. My Supervisor who taught me well was Sean Buggy, Senior Customer Accounts Executive. I had the greatest opportunity to learn from Sean, who was able to teach me how things work in RTA. This experience has developed my learning and understanding of what is expected of a Professional Electrical Engineer.

I was able to learn so much in a short period of time. Due to having done six months in Network Planning, three months in Capital Program Delivery (Projects) and three months in Regulatory Transmission Access, I am more aware of how TransGrid operates its high voltage Network. Also I am able to better understand TransGrid's relationship with AEMO, the NEM, AER and many other organisations within the electricity industry.

In conclusion, this role in RTA was a good opportunity to develop and challenge my weaknesses in accounting, economics and commercial. As it turned out, my experience in RTA was extremely interesting although it did not involve technical engineering tasks. I appreciate this opportunity to have explored the different tasks which were assigned to me, as they were beyond my capabilities and comfort zone. I found it unusually interesting and a rewarding experience to apply my engineering skills to another engineering field.

**STUDENT:** Bradley Benson



**COMPANY:** INTEGRAL ENERGY

For my 2009 vacation work placement I successfully applied for a position with Integral Energy. I was stationed with Transmission Mains, under John Broadhead (Transmission Mains Manager) at their Field Services Centre in Glenndening. The purpose of this placement was to gain an insight into the structure and function of the network within Integral Energy's area of operation. This report reflects on my time spent with Integral Energy commencing Monday 4th January through to Friday 29th January 2010. During this time I participated in many tasks allowing me to contribute to the Integral Energy's network and community.

While with Transmission Mains, I gained access to much information which showed me the magnitude of the current challenges facing power engineers as well as those in the future. Through my time spent at the Huntingwood control room I gained awareness on the present challenges facing Integral Energy today. Such challenges include those relating to weather and network demand. These challenges require innovative solutions to support increased future demands. This is the primary role of the Transmission Mains team and includes the maintenance, reconstruction and development of new underground feeders and transmission lines. The important ingredient to this development is sound planning through communication with infrastructural organisations and the establishment of a reliable network to ensure future demands of forthcoming commercial and residential growth are met.

During my work placement at Integral Energy showed me that the needs of the environment must be taken into account when planning and managing projects. Work done on the network can have both a short and long term effect on the environment. Short term effects to the environment can be as small as the work practices of the field crews and as large as the materials and equipment used. The long term effects are significant as the infrastructure will be in place for many years to come. It therefore must allow for the coexistence with its surrounding environment with minimal to no impact.

My experiences have allowed me to witness the importance and value of power engineering in developing a safe and reliable network, as well as the effect this has on the wider community. I found my placement with Integral Energy highly meaningful, educational and relevant to my future in Power Engineering.



**STUDENT:** Shaun Bartlett

**COMPANY:** TRANSGRID

During the Summer 2009/2010 university break, I undertook vacation employment as a recipient of the Australian Power Institute Bursary. In this vacation period, I was employed by TransGrid who is the owner, operator and manager of the New South Wales (NSW) high voltage network connecting generators, distributors and major end users in New South Wales (TransGrid, 2010).

In this report, I will reflect on some of the experiences both previous to employment and contrasting it to the vacation work and also cover the knowledge and understanding that I obtained from this vacation work placement. I will aim to cover the work I was involved in and the processors developed and also those which defined the way I approached the work provided.

In the current environment of power, we have all seen the need for green power, but what some may not understand is the ability for green power to currently maintain the requirements of the market and that even though there is a future for green energy, it is important to weigh up the need for constant power to consumers against the growing need for green energy. This provides a challenge to soon to be power engineers, and why the importance of the experience outlined within this report is important to getting a running start when moving into the industry at the completion of a university degree.

In addition to this challenge for the industry to adapt to the need of green energy, my personal experiences have found a large gap in the ages of those working in the industry and a problem with the experience and knowledge not being passed on from those retiring to those starting creating a black hole of knowledge. What may come of the future is that the current generation of engineers may be facing a relearning process due to this and this is why organisations such as the Australian Power Institute have formed so that people aiming to work in this industry are knowledge gathering before they begin in earnest.

The work involved during the placement proved its' challenges and the best way I found to approach any issues was to either consult industry standard practices (Australian Standards) or seek help from colleagues. It may be thought that an organisation that is based around power employs Electrical Engineers only, it would be an incorrect assumption, where I had worked with two Civil Engineers and one Mechanical Engineer in a team six project managers. The backgrounds of each field allows a broader spectrum of knowledge to be passed around for the benefit of the industry as a whole for any projects developed will be of the highest standard available.



**STUDENT:** Kevin Lee

**COMPANY:** JOHN HOLLAND

The purpose of this report is to inform readers of my personal learning and development while undertaking Vocational Placement 2009 with API. While undertaking this vocational placement, I believe my level of communication and technical skill had increasingly developed due to application of the company management systems. During my period of employment at John Holland, I worked in the "Power" division under the supervision of Dimce Mihailovski.

While working at John Holland, I was able to see how Engineers in general communicate with each other and their associates. While being introduced to project "BRAEMA," I was exposed to the operations required by Power Engineers to construct such a project. The tasks involved in constructing a project like this allowed me to see that it is not a simple job and requires many hours of tendering. The experienced gain is priceless and cannot be academically taught in any other situation that the work environment.

To summarize my time at John Holland, I mostly spent my time tendering on projects and completing tasks. The process required me to fulfill the task of making contact with suppliers and following up on the quotable proposal. In some instances, suppliers would delay on the quote; and would require a following up reminder. Due to the projects usually being out in rural area, suppliers were difficult to find and get in contact with. As I soon learned, in order to tender; a voice to voice contact is the best way for communication followed by an email. Request for proposals to more than one supplier assisted by diversifying the range of prices. It is crucial to remain in constant communication and develop rapport is required in order to keep on track.



**STUDENT:** Rainer Scheurer

**COMPANY:** Delta Electricity

The aim of this report was to provide an overview of the summer vacation experience 09-10 as part of the API Bursary Program and to demonstrate that learning has taken place. Some of the skills and knowledge gained during this period, that were gained were highlighted to emphasise the purpose of the vacation program. The purpose of the API Bursary Summer Vacation Placement was to gain practical experience in the Power Industry.

Delta Electricity, which provided me with an undergraduate position, is a power production company. Their portfolio includes 4 base load coal fired power stations and 4 peak load Gas Turbines located in the Central West and the Central Coast of NSW. Previously known as Pacific Power, the company has been in operation since 1950, providing NSW with base load electricity and recently peak load electricity.

From my experience at Delta, I have discovered some challenges that the power industry is facing. One example is Australian Energy Management Organisation (AEMO), the organisation which runs the electricity grid of Eastern Australia, has frequently had restrictions on interstate transport of electricity. This limit's the amount of export and import capabilities of NSW. If Australia wishes to increase its green energy quota, then there needs to be greater peak transport capabilities of the grid to cope with the fluctuating nature of wind or solar. Another challenge discovered within Delta was the environmental and mechanical restrictions placed on its power stations.

On a personal level I was confronted with multiple challenges, during my placement. Initially the challenge was adapting to a new workplace. Later each assigned project would introduce new challenges every day. Each project I was given had different methods and solutions and it took my engineering skills to pick the best method and solutions to provide Delta Electricity with the best result. Some methods included trial and error, historical data assessments or manufactures recommendations. The challenges extended outside of these projects. Time management and team work skills all played a major role in satisfying the needs of co-workers and ultimately Delta Electricity.

Overall the experience gained at Delta was priceless and unattainable in any lecture theatre. It is recommended that any Power engineering student gain valuable practical experience in the Power Industry, whether it is in Australia or overseas.



**STUDENT:**                 **Simon Varley**

**COMPANY:**               **Delta Electricity**

From July 2009 to February 2010 I worked at Delta Electricity on a full time basis to gain practical experience in the power engineering field and to develop a better understanding of the industry.

Delta Electricity is a power generation company and I spent the term of my internship at their coal-fired power stations near Lithgow, New South Wales. My time was spent with the asset management group which looked after all of the plants' external assets; those that support the power production process and include the coal handling, water treatment and ash collection plants.

This report describes some of the experiences that I had, gives many of the projects I took part in and some of the numerous lessons learnt in this time. In all this the value of industrial experience in preparing undergraduates for their future careers as the power engineers is highlighted and some of the most important skills required of power engineers by the industry are identified.

This internship was not without its challengers. The most over-arching of which was my understanding of the power production process. I was faced with the daunting task of coming to understand the plant and it's complex operating modes, which are forever shifting, in an ever-changing context. This required self-directed research and endless querying of everyone else in the section.

Throughout my industrial experience I was deeply impressed with the myriad of engineering challengers that the power industry faces in day-to-day operations. The pressures of maintaining a high level of availability and meeting grid demands are enormous, while the opportunities for plant maintenance are often limited by external forces, meaning that a highly developed asset management strategies are required.

During the time I spent at Delta I developed an understanding of the industry and what is required of power engineers starting out in the field; a passion for the industry, an understanding of the process and a commitment to continual learning as technologies are updated and new methodologies are developed. I now understand that this is a field that offers both great challenges and rewards for those who are willing to commit to a career in the industry.



**STUDENT:** Robert Alcaro

**COMPANY:** TRANSGRID

My 2009/2010 vacation work experience placement was with TransGrid. TransGrid is the owner, operator and manager of the high voltage electricity transmission network within New South Wales moving the power from generators to distributors and major end users. I worked with TransGrid in the Capital Program Delivery/Projects group for eight months, which included the summer vacation period, as part of my first internship which is a component of my engineering degree at the University of Technology, Sydney.

While with TransGrid, I worked on a number of capital projects the company was undertaking. The main project I worked on was the Dumaresq to Lismore 330kV transmission line project. This project involves building a new 205km 330kV single circuit transmission line from the Dumaresq Switching Station at Bonshaw to Lismore Substation. The project also involves the associated line bay works at Dumaresq and Lismore and building a new 330/132kV substation at Tenterfield which the new line will connect to. This new transmission line, at a cost of \$227 million, will be used to provide an additional supply to the far north coast of NSW which is projected to have a 40% increase in demand over the next decade.

When I started with TransGrid the project was still in its initial stages of route selection and community consultation which I was able to be part of. I learnt a lot about what to look for when choosing a transmission line route, stakeholder management and created and managed a project database for the project team to use so that landowner correspondences could be easily kept tracked of and updated by the project team. As the project progressed, I was able to be involved in the preparation of the Environmental Assessment (EA), which was something I previously did not know much about. I compiled a suite of required information and coordinated the review of the EA by TransGrid for the consultants who were preparing the report to be submitted to the Department of Planning.

Running concurrently with the preparation of the EA was the transmission line design. This part of the project highlighted the importance of good communication skills as I was required to convey design issues between the project manager, design team, design consultants, environmental consultants and surveyors. The design process was a very interesting process and I gained knowledge in transmission line design. I learnt about the many variables in transmission line design including wind spans, weight spans, equivalent spans, how the conductor behaves under blowout conditions, conductor sag and structure selection and design.

Through my employment with TransGrid I was able to learn alot about the importance of cost, time and scope management. Scope creep, or scope change, was a prominent issue on this project which had the possibility to cause detrimental effects to the project. Through using project management software I was able to keep track of the project cost and schedule and then produce the monthly project reports and budget updates. I was also able to help write an options report detailing the effects on the cost and program of



the project as well as the community acceptability for a number of potential solutions to a change of the scope of the project.

This vacation employment showed me how what we learn at university can be applied in real life to major infrastructure projects. It also taught me a lot that I may not have learnt at university such as the community consultation process, transmission line route selection process, stakeholder management, environmental assessment and approvals process. This is necessary for any major project to be constructed successfully. This summer employment with TransGrid has provided me with a rewarding, worthwhile and invaluable experience.



**STUDENT:** Daniel Watson

**COMPANY:** Delta Electricity

I worked for Delta Electricity as an Undergraduate Electrical Engineer from January 2009 to July 2009 and again from December 2009 to February 2010. This formed part of my six month internship which is a component of the Diploma in Engineering Practice part of my UTS Degree. I worked at Vales Point Power Station in their Central Coast Plant Performance Group. Delta is the largest producer of Electricity in NSW with over 5000MW of Generation Capacity.

This report is to outline my placement within Delta and highlight key events and learning outcomes from my time within Delta. This report covers the projects I was involved in, mainly Efficiency Analysis, Plant Component Testing, Heat Rate and Absorption and also increasing Operational Efficiency through the use of integrated excel documents and macros.

The power industry is a large and ever evolving workforce. There are many different challenges emerging daily and these need to be overcome, whether this is the heightened awareness for Carbon emissions or maintaining an ageing station at a high efficiency.

Throughout the Internship I was given many problems to solve, one of which was the comparison of Losses method to the input/output method for station efficiency. To solve problems encountered during analysis such as this I was able to consult colleagues, the plant design manuals, and the digital computer system. Throughout my time within Delta I was able to increase my knowledge of Visual Basic code and enhance my Excel skills.

Being placed in the plant performance group I was able to experience all aspects of the site from coal delivery, bulldozer management to station running and individual component efficiency. I was able to involve myself in different parts of the company, such as a bulldozer incident investigation, air heater leakage testing and PA fan testing.

Overall it was very worthwhile to work for Delta and has helped my degree immensely. It has increased my enthusiasm to perform and complete my degree to enable me to enter the workforce. It has given me a practical application and reinforced things learnt at a theoretical level in uni. I was able to get an overview of the generation aspect of the industry and how everything is interconnected.



**STUDENT:** Matthew Ley

**COMPANY:** TRANSGRID

For 12 weeks between 30th November 2009 and 26' February 2010 I was employed as a work experience student for Transgrid. During the 12 weeks I worked at Wallgrove in the Operations Technical Support Group as an undergraduate electrical engineer.

Before I commenced working for Transgrid I set myself the following objectives:

- Gain a greater knowledge about the transmission of electricity
- Solve different types of electrical problems
- Gain greater knowledge about electrical engineering
- Learn more about the transmission from electricity

Over my 12 weeks working for TransGrid my main job was updating a grid operating manual OM521, the operation of the main grid during outages of single circuits. The manual includes detailed operating limits for use by AEMO to formulate constraint equations used for generation dispatch so as to provide a ready appreciation of the effects of a particular outage (OM521 J Peiris). For this operating manual I had to cater for a planned outage plus the trip of another line. Using PC Load Flow (this is a software used to model the power system and simulate power flows) and excel I was able to generate the equations for AEMO. Over the 12 weeks I completed other jobs as well. One job I performed was updating the diagrams in an operating manual to include Wollar and Bannaby substations which are planned to be commissioned soon. For this I changed the diagram so these sites were included and modified the text so the description for the diagram was correct. Another job I performed was reviewing the autumn loads for distributors to update our PC Load Flow model, This involved using data given by Integral Energy, Energy Australia and Country energy as well as using readings that we had collected and putting it into a table making it easy to find the information. While I was at TransGrid I was fortunate enough to be given a tour of the substation and control room which gave me a greater understanding of the electrical network.

Throughout my employment at TransGrid I was able to complete all my objectives that I set. Working in Operations Technical Support I was given the opportunity to enhance my knowledge of the distribution of electricity as well as improve my computer skills which will greatly assist me though out my university degree. Overall my vocational work experience at TransGrid was a great educational and practical experience for me.



**STUDENT:** Benjamin Kocal

**COMPANY:** INTEGRAL ENERGY

During the summer of 2009-2010 I worked for Integral Energy within their Regional Services and Transmission Central sections.

Having just finished second year of electrical engineering, my objectives were to:

- Develop a greater understanding of the challenges faced in power distribution.
- Apply knowledge gained in university to real world applications.
- Expand my comprehension of the power engineering field and electrical network.
- Gain a greater technical understanding of power engineering.

Using a variety of engineering-specific programs I was given the task of mapping the plans for the replacement of an overloaded pole-mounted substation. The pole-mount sub was to be upgraded from a 300kVA rating to a 400kVA rating. My responsibilities included having to work out where to break the network circuit to isolate the pole-sub, and consequently how many customers would undergo an outage. Furthermore, I worked out how to keep as many customers connected to the network during the planned outage as possible- by breaking LV bonds, for example.

Other challenges included calculating the height of new power poles to be installed by taking into account such factors as the sag and electrical safety clearances between other equipment, cables, and trees. This was of course done with reference to the electrical safety standards manual.

Another Computer Aided Drawing (CAD) project involved me mapping an area where bare cable was to be replaced by Aerial Bundled Cable (ABC). ABC was more aesthetically pleasing and required less clearance from surrounding trees. After calculating where to break the circuit and such, I moved on to use a program called Work Management Estimator. Work Management Estimator provided a way to estimate the cost of such a project and went into such detail as to include traffic management services and time/distance to the site. In addition, and quite importantly, an Environmental Impact Assessment (EIA) was completed and accompanied every one of my projects.

Also of high value was the experience and knowledge gained working with the Protection Specialists and Technicians. I was given the task of working out the current distribution of faults in delta-star transformers. This allowed me to understand the notion of 'blind spots' and how relays reacted to different faults on the network. Furthermore I tested various relays in the protection laboratory before they were put into service. This provided a greater understanding of the inner complexity and yet exterior simplicity of the relay itself.

Overall, the experience was of great value to my understanding of power engineering. It furthered my knowledge of design, regional services, and distribution immensely. The use of computer aided drawing tools and other software proved beneficial to my continued learning and awareness of the work of power engineers in the distribution field. Thus, on a whole, the experience was particularly positive, advantageous, and rewarding.



**STUDENT:** **Joshua Spence**

**COMPANY:** **AUSTRALIAN ENERGY MARKET OPERATOR (AEMO)**

My name is Joshua Spence and I am currently study B Engineering (Electrical) / B Science (Computer Science) at the University of Sydney. As a recipient of the 2008 API Bursary, I was fortunate enough to be involved with vacation placement within the API sponsor organisations every summer holiday between university years. From December 2009 to February 2010 I have been working as a part of the Metering and Settlements team within AEMO. I have been based in Norwest and working under the direction of Chris Muffett.

Working for AEMO has been a unique and enjoyable experience which I would undoubtedly recommend to any aspiring engineers. I came into this experience having little idea about the National Electricity Market, and the role of AEMO, and so it was enlightening to be working as a part of the operations team, working at the front line of AEMO.

Working for AEMO has greatly expanded my view of the National Electricity Market and enlightened me into some of the background processes that within the whole power system. It was definitely a worthwhile experience and I enjoyed working with the peers in my team. I felt liked a valued member of the group and appreciated that any progress I made in the tasks I was given, were helping the team.

**STUDENT:** Andrew Palummo



**COMPANY:** ENERGY AUSTRALIA

This report is a summary of my time as a work experience student situated at Energy Australia's Pymble office, working within the Maintenance and Replacement Planning section, a division of System Planning and Regulation. During my time in the Maintenance and Replacement Planning Section I was given a primary and secondary project to complete.

My primary project involved pole condemnation trend analysis. I was required to gather and collaborate sets of data spanning a four year period to try and identify and explain any trends regarding the rate of condemnation on several different views of the network (e.g. region and district levels). The outcome of this project was to try and resolve an issue regarding a lack of work generated after the condemnation of poles within some districts.

Poles are an essential asset to Energy Australia as they provide a safe medium for the electrical energy flowing through overhead mains to be distributed to their customers. Being able to see the trends in the data I collected and to apply some of the analysis methods learned at university, this project allowed me to develop my analytical skills and gave me an insight on some of the procedures and network standards that govern Energy Australia's most commonly seen asset.

My secondary project was a condition risk assessment of Botany's zone substation. I valued the time spent on this report as it allowed me to go out on field, identify and assess potential hazards, taking note of each hazard's level of risk and making recommendations on those risks to try and reduce the severity of their potential impacts on not only the site and surrounding equipment but also on the network and essentially, Energy Australia's customers.

I was also able to physically see the connections between feeders and transformers, bus bars and circuit breakers. From a Power Engineering perspective, this was an excellent way for me to further my understanding on the distribution of power and energy in New South Wales and obtain a basic understanding on how some of the equipment mentioned above operate.

During my time at Energy Australia, I've been able to learn so much through their training program, tasks and projects assigned to me and of course from the people I've worked with.

The work experience program has given me insight and a better understanding on how the electrical network is run from a high voltage transmission level, all the way down to 415V distribution level. I've had the opportunity to visit substations and see the type of equipment and other assets that maintain power to my local community.

Overall, I've highly valued the positive and constructive experience working at Energy Australia and would recommend it to any undergraduate electrical engineer.

**STUDENT:** Alanna Vial

**COMPANY:** ENERGY AUSTRALIA

In the summer of 2009 from the 30th of November to the 19th of February I participated in the Energy Australia Work Experience Program. I was commissioned to work in substation engineering specialising in protection engineering for the duration of my vocation placement.

There are numerous challenges often encountered in protection engineering, which must be overcome for the safe distribution and transmission of electricity to EA customers. These include analysing all the possible fault currents that can arise in worst case scenarios, such as a tree falling on a power line, and ensuring the necessary measures are in place for complete consumer and worker safety. These safety designs include implementing relays, circuit breakers, fuses, current transformers and voltage transformers with the correct settings to trip the system in the event of a fault.

My vocational experience has exponentially increased my understanding of the processes involved in power systems analysis for protection engineering. As a first year engineering student, I have encountered multiple new challenges during my work placement which I have conquered through extensive study and determination.

I was commissioned to find the three phase fault currents and A-phase to ground fault current for Auxiliary Transformer 3 at the Kurnell zone substation. To accomplish this task I was required to learn per unit and three phase sequence systems analysis, taught in fourth year, to find the fault currents between the two three windings transformer banks. I have also studied the applications of fuses for utilisation in protection engineering systems extensively.

Overall, I have found the Energy Australia work experience program to be a rewarding and highly educational learning experience and I would highly recommend it to other prospective work experience students as an opportunity they will not regret as I have enjoyed my work placement thoroughly.

**STUDENT:** Anton Marinov

**COMPANY:** ENERGY AUSTRALIA

During the period from 30th of November to the 19th of February 2009, I was employed by Energy Australia as part of their Work Experience program. The purpose of this report is to provide detailed information about my experiences in working in a real engineering environment, and to demonstrate that I have acquired knowledge and experience in written communication of technical ideas.

At Energy Australia, I was allocated to work in the System Planning and Regulation Division, under the Maintenance and Replacement Planning Branch. This branch is responsible for managing and maintaining the physical assets of the company, which are active parts of the Sydney electricity network.

As part of my employment, I was required to overcome a number of challenges in order to complete my assigned work, which consisted of two main projects.

My first and major project was the creation of a replacement sub-programme for a specific type of underground distribution cable that was known to cause problems. The major challenge for this project was learning very rapidly the fundamentals of the Energy Australia electricity network, as I had no previous exposure to such concepts. This was overcome by simply listening to various staff members explain the ideas and asking questions wherever possible.

As this was a large project, I was allocated to complete this task in a team of two. Thus, another challenge for this project was the allocation of tasks to individuals which was overcome by dividing the project into two main areas: technical and non-technical (eg documentation, communication etc). This allowed me to enhance my teamwork and communication skills.

Secondly, my second and minor project was the preparation of an Asset Condition Report for the Newcastle City Main zone substation. Built in 1937, the building was also subject to the 1989 Newcastle earthquake, and had sustained some damage. The challenge for this project was to understand and learn about the ways in which certain types of risk eg. Environmental, Safety etc should be measured and documented in a detailed report. Once again, this was overcome by utilising the vast knowledge of other engineers.

In summary, though challenges faced and problems overcome, I can say with certainty that my placement at Energy Australia was an extremely worthwhile experience.

**STUDENT:** Christian Webb



**COMPANY:** ENERGY AUSTRALIA

This summer I worked at EnergyAustralia, under the Duty of Care section. This section is primarily responsible for ensuring the assets of the company are compliant with applicable codes and regulations; however it also aims to mitigate the risk of harm to people property and the environment. In practice the majority of work in the section was the allocation and distribution of funds and communication with other sections of the company to co-ordinate and organise projects and programs. In addition to the work I performed for Duty of Care, I performed a condition risk assessment on Mascot zone substation, and a comparison of feeder commissioning dates between two different sources in order to update one of the company's main databases.

This work offered a diverse range of challenges, and a great deal of scope for me to improve my skills as an engineer. Writing reports, including risk assessments for substations and project funding approvals, required both the technical skill of writing concise and clear reports as well as an understanding of the power distribution system to evaluate the necessary outcomes of projects. As a first year engineer with little practical knowledge of power electronics and distribution I was able to greatly develop my understanding of the structure of the grid maintained by power engineers, as well as the diverse range of engineering challenges faced every day by the company and its engineers. In addition to this I performed a great deal of work involving the manipulation and editing of spreadsheets, and I found that by learning to use the language VBA and automate regular logical tasks I could work significantly more productively.

In conclusion, my placement in Duty of Care was excellent for a young engineer with my level of knowledge as it allowed me to work with the distribution grid in general terms, to learn the basics of power engineering. In addition, many of the skills required of professional engineers are required from this section, and as a result I was able to develop and improve these skills for use in my future career.



**STUDENT:** Sam Shan Jiang

**COMPANY:** TRANSGRID

During a period of 13 weeks from 31st of November 2009 to 26th of February 2010 I was employed as an industrial student by TransGrid, a state owned corporation that owns, operates and maintains NSW high voltage network. I worked under the supervision of Col Draper, a senior project manager within the project section in the Capital Program Deliver business unit.

The project group is mainly responsible to manage the design stage of the whole project development cycle of all the major capital works carried out in TransGrid. One of the projects I managed was change of transmission line at Newcastle Substation. Energy Australia was building a new substation Kurri Kurri Zone substation in the Newcastle area in order to match the increasing demands. TransGrid provides the motorway for the energy flow between power generator and power distributor like Energy Australia. Therefore a transmission line needs to be set up between TransGrid Newcastle substation and Energy Australia Kurri Kurri Zone substation. While Energy Australia is responsible for the transmission line, TransGrid is responsible to set up communication, protection and control in the Newcastle substation. It was a new project given to the group and it exposed me to the beginning stage of project management, this stage mainly involves the initiation of the project and my duty includes holding launch meeting with stakeholders, setting up budget and schedule for the project so it will appear in the database and composing project plan which will state the work scope, cost and completion date. Because this project also involved another company, Energy Australia, the design groups of communication, control and protection in TransGrid is required to work with their correspondences in Energy Australia. It was my job to ensure that communication between the two companies was sufficient and I held meetings that involved stakeholders in both companies on site to clarify many confusions and issues.

My work experience with TransGrid had exposed me to many different aspects in the power industry. This included knowledge in the state scale such as the structure of power transmission network in NSW and what role TransGrid played in the network and national electricity market. I learnt knowledge in the company scale such as how a major capital work undergoes a complete project cycle from studying demand, predicting future trends, to plan and design the project and finally to the commissioning of the project. I also had a chance to manage different projects which allowed me to understand the detail process of the design stage of the major capital works in TransGrid and the importance of communication and co-ordination in the power engineering field. Overall my vacation work with TransGrid has gained me valuable technical and practical experience and I highly value it.



**STUDENT:** Mark Loneragan

**COMPANY:** TRANSGRID

During my employment at TransGrid I worked in the projects department. TransGrid is the owner and operator of the New South Wales electricity network, a key strategic asset servicing Australia's largest economy. The corporation is responsible for the operation of approximately 12,440 kilometers of high voltage lines and 82 associated switching and transformation facilities that transport the State's electricity from point of generation to distributors.

The purpose of this report is to inform of the learning taken place by me as part of the API Bursary Program 2009 and to demonstrate the knowledge and experience I have gained as part of my valuable employment here.

Power engineering is a challenging field that is ever changing for the better. My employment at TransGrid has been an invaluable experience that, combined with my studies at The University of Wollongong , will help to make me a greater engineer in the future. This practical work has put into action many of the theories learnt in my past year of study. Combining on the job training with tertiary studies is a great way to learn.

The main problem with working in an environment of fully qualified professionals is having a lack of knowledge about the greater world of power engineering. After reading through many documents I have gained a better understanding of what it takes to become a functioning member of this team.



**STUDENT:** Peter Cheetham

**COMPANY:** TRANSGRID

Between the 30th November 2009 and 26th February 2010 I undertook work placement at Transgrid as part of the API Summer Vacation Placement program. Transgrid is a state-owned company which is responsible for the management and construction of New South Wales's high voltage network.

While at Transgrid I was placed in the Control Systems Implementation (CSI) Group which is managed by Christopher Stevens. The CSI group is responsible for the design and advises in the implementation of secondary and auxiliary services for substations. This role includes liaising with contractors in the completion of projects, completing the design of automation systems and analysing designs for secondary system documentation.

During my placement in the CSI group my main job was to check schematic drawings. At first I was only checking for grammatical, quantity and layout errors, however as my understanding of schematic drawings increased I learnt to check other areas. The other areas included checking that the wire numbers were correct for the links, fuses and terminals. I also checked equipment on the schematic diagram (such as circuit breakers) against the manufacturers diagram to ensure that the correct parts were being used.

My placement also gave me the opportunity to visit pre-FAT (Factory Acceptance Testing) tests in Wetherill Park, the test lab at Wallgrove and different Transgrid substations which included the new Haymarket Substation.

In conclusion my time at Transgrid was enjoyable and I have gained valuable information that will help me in becoming an electrical engineer. I would like to thank the API for giving me this opportunity and everyone at Transgrid who helped me during this period. I have no hesitation in returning to Transgrid next year for summer work placement or recommending it to anyone else interested in this line of work.

**STUDENT:** Michael Riordan

**COMPANY:** Country Energy

My 2009–2010 Summer work experience was undertaken at Country Energy Lismore as part of the Substation Maintenance and Construction crews.

The purpose of this report is to outline the duties and tasks I performed during this time and to elaborate on the problems encountered, the methods used to solve these problems and the lessons I learnt as a result.

The main project I was involved with during my work experience was the construction of a new 66kV feeder bay in the Three Chain Road Substation that is operated and maintained by Country Energy. The project was an exceptional learning experience as it gave me an insight into a wide variety of technical disciplines in the power industry and provided first-hand practical experience of the many challenges employees in this line of work face. The following are just some the activities I was involved in during my work:

- Removal of the old feeder bay that was being replaced
- Wiring of the new feeder protection systems, which also involved reading and interpreting wiring plans
- Construction of new formwork and footings for the new bay (see v & vii)
- Standing of the new Voltage Transformers and SF6 gas Circuit Breakers. (see iii, iv & vi)

As I quickly learnt the most important aspect of all these activities was safety. The biggest safety concern was the fact that we were working inside an operating substation with live apparatus all around the work area. This was by far the most challenging aspect faced as there was large machinery such as excavators and cranes operating inside the substation.

Safety was first and foremost managed by the completion of Country Energy's formal Hazard Identification, Risk Assessment and Control (HIRAC) form at the start of each day before any work commenced. Along with the HIRAC, all work was completed with adequate safety observation and strict adherence to Country Energy's Electrical Safety rules (i).

Overall, the work Experience Country Energy provided has given me an invaluable insight into many of the challenges, safety concerns and procedures of the power industry. As a young engineer the first hand experience in the field will be a great benefit for future work and has bestowed in me an appreciation for the role of not just engineers, but all workers in the energy industry.



**STUDENT:** Mathew Lee

**COMPANY:** TRANSGRID

Field of Power Engineering: Transmission of electrical power from power generators to retail distributors

The following report is written with the intent to inform its readers of what I have accomplished and to demonstrate any technical knowledge I have acquired over the course of my 2009 vocational employment at the Transgrid Wallgrove substation and Central office.

Even though my 2009 employment was brief (four weeks), I found this time to be invaluable as I was able to observe and experience how electrical power engineers are utilised in the real world. Specifically the electrical engineers at Transgrid that I interacted with were busy working on crucial tasks to maintain the electrical power distribution across New South Wales by for example introducing new sensory systems for substation components such as voltage transformers and circuit breakers.

In summary, the tasks I was assigned at Transgrid were determining which newly integrated sensors at the new Yass 300/132 kV substation as part of universal substation component reporting network were operating properly, conducting a comparative study into the difference between the two methods for determining the volume of water in transformer oil, determining if spare transformers would fit (transformer and cooler slab, overhang and adequate electrical clearance) in their designated compounds as a precaution for transformer breakdowns and determining the load percentage of all substation transformers grouped by secondary winding wattage for insurance purposes.