

Executive Summaries

2008-2009 Bursary Vacation Placements in NSW

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STUDENT: Ashley J Bruce

COMPANY: INTEGRAL ENERGY



From 29th of December 2008 to 27th of February I was employed at Integral Energy, based at Huntingwood Office, under the Operations Planning Manager John Pang. This report is a outline of my experience and things I have learnt at Integral Energy.

My first week involved the usual security check, meeting and greeting and assignments before I was introduced to the control room and all of the System operators. I was shown how to write the switching instructions for planned jobs such as substation refurbishment and pole repairs. Over the next week I under took training at the Hoxton training centre on electrical safety rules, first aid and high voltage substation entrance.

After the training I was then able to be deployed out in the field with the district operators. This involved a lot of switching with air break switches and under slung links as well as climbing poles to place and remove earths.

The remainder of my time was spent at the Huntingwood office, in the System Operations branch. The first task I was given was to create a chart for district officers on the magnitudes of fault currents and their modulation through the grid. This showed the fault current ratings required for elements along a distribution line based on their distance away from the fault and impedance characteristics of the line.

I also had to research the amount of fuses blown on overhead lines and show the importance of reliability over the years. This was then analyzed in comparison to the temperatures and storm events to find the correlations. Other work included investigations of fault currents and transients from a new generator and the use of simulation programs to calculate load flow reports for those generators.

My time at Integral Energy allowed me to use the technical skills that I had learnt in university and demonstrated how the calculations that we performed in classes can be used in the real world. I leant a lot about the rules and regulations in electrical distribution and the software and process that Integral Energy uses in day to day maintenance and operations, making this a useful and constructive experience.

STUDENT: Alex Ben
COMPANY: ENERGY AUSTRALIA



For 12 weeks between 1st December and 20th February, I was employed as a vacation student by EnergyAustralia. During this period I worked within the Network Pricing team, as an undergraduate electrical engineer.

My objectives for the work placement were:

- To increase my technical knowledge of applied electrical engineering principles and pricing structures,
- To understand the organisational structure of the company including where the section that I worked in fits in, and procedures in place within the organisation,
- To successfully complete a project individually
- To increase my understanding of the regulatory framework relating to electricity prices

While working at EnergyAustralia I was given several projects and tasks to complete. The first was to conduct a review of network tariff structures in overseas countries. This included research of overseas distribution companies, using the internet to gather information about network tariffs and tariff components. This information would be used to better assess current tariff structures, and to assist in future tariff implementation. I also worked on adding attachments to the Revised Proposal to the regulator as part of a 5 year cycle. The attachments provide the sources of information used as a basis or supplement for statements and arguments to the AER. The last task I was given was to create a Level 2 process map of the Network Pricing team. This involved investigating what processes occur and what data objects are involved by talking to different people in the section. The information was then organised to form a process map, representing the dependencies and data flow between processes.

Throughout the time spent at EnergyAustralia I have been able to successfully complete my objectives. In individually completing the project of reviewing overseas tariffs I gained research and analytical skills as well as increasing my technical knowledge of electrical engineering. Having worked on creating a process map of the section has allowed me to gain communication skills and also increase my knowledge of the functions and role the section plays as a part of the whole organisation. Working on the revised proposal to the Regulator has contributed to developing problem solving and time-management skills, as well as giving an overview of aspects relating to regulation.

Overall, my work placement at EnergyAustralia was a valuable, educational and positive experience.

STUDENT: Benson Bradely
COMPANY: ENERGY AUSTRALIA



For 4 weeks between 27th January 09 and 20th February 09 I was employed as a work experience student for EnergyAustralia. For this period I worked at the Homebush Depot with Distribution Engineering Services. This Section was made up of 3 teams, Underground, Overhead and Special Projects, while only being there for a short period of time I worked under both underground and overhead teams.

While at EA I took part in many little tasks the first of which was the writing of a draft Distribution Guidelines for the use of Insulation Piercing Connectors (IPC's) to connect Mobile Generators (MG) to Aerial Bundled Cables (ABS's). This would allow power to be provided to streets while there is a prolonged outage or fault. I also took part in developing a database that outlined all the cable joints within the EnergyAustralia guidelines. This database would allow field staff to open and view all the required parts and their corresponding order numbers, inturn saving time. This job led into my next with an investigation of a cable from the central coast. A sample of a cable was sent to distribution engineering services to be investigated; this cable was found by the field crews covered with an orange substance completely covering the lead sheath. I was charged with organising to have the cable looked at by EA's Network Testing Section.

Cable Joint Installation Guidelines are an accepted set of guidelines produced by EnergyAustralia and the respective manufacturer on the correct procedure for the joining of two cables within all the various conductors, sizes and configurations. I was asked to help with the production of 3 such documents. The final task that I undertook was in regards to Earth Potential Rise & Induced currents and voltages, which pose a hazard to line workers and especially in particular cable joiners. EA was recently consulted by Safearth, which is a business of EA's, on this hazard, I did calculations to determine a distance between cables to minimise induced current.

While working for EA I learnt a lot, and how all the theory that I have learnt at university fits in to the big scheme of the power network. The knowledge of the employees within this section was immense, and I found I learnt a lot more through them than I could of from a text book, for that reason this work placement was especially valuable to me. I gained skills in finding relevant information within EnergyAustralia's database and technical guides and standards. I learnt about the basic building block of the power network that being the cable and its many shapes, sizes and configurations.

STUDENT: Poon Christine
COMPANY: ENERGY AUSTRALIA



For a 4-week employment placement in February 2009, I was given the opportunity to gain further insight into the diversity of power engineering at the Energy Australia Transmission section, which is in charge of monitoring, maintaining and overseeing projects to extend or improve the transmission network controlled by the company.

This experience proved to be especially valuable to me as a non-electrical engineering student. Despite the brevity of my placement, and the fact that I did not have a significant amount of electrical engineering background knowledge to undertake certain jobs, section staff immediately took to familiarising me with their work and computer programs such as GIS, which increased my technical skills and the amount of constructive work I could do with report and data interpretation. The numerous visual inspections I accompanied transmission staff on allowed me to appreciate the need for not only technical engineering but also managerial skills, and high level of internal organisation companies such as Energy Australia have to maintain in order to provide a reliable supply of power to millions of customers around the country.

It was through such inspections, e.g. the replacement of old Dalton tower insulators and an OPGW project that I was able to fully appreciate the paramountcy of good communication and teamwork synergism for maintaining efficiency. Likewise, the diverse nature of skills required in a team became apparent – not only managerial, but also the level of physical labour involved in maintaining the network, that can only be attained through thorough training and experience.

A facet of working as an engineer, electrical or otherwise, that I hadn't envisioned before the placement was the amount of delegation and third party involvement required for both capital projects and basic maintenance jobs. It was refreshing to be able to sit through a meeting where multimillion dollar contracts were negotiated professionally, and to be introduced to common difficulties the company faces e.g. in enforcing property laws for easements.

Another preconception I had prior to this placement was that efficiency could be easily maximised by automating more processes, via computer/aerial monitoring or mobile communication as opposed to physical travelling to sites. However, the complexity of certain jobs highlighted the reverse need, i.e. training more staff to overcome the graduate employment shortfall faced by the power industry, and subsequent strains on the existing workforce.

Overall my vacation employment placement at Energy Australia was a highly educational and rewarding experience.



STUDENT: Clarke Justin

COMPANY: ABB AUSTRALIA Pty Ltd

I worked for ABB Australia Pty Ltd as part of a six month internship that is a component of my engineering degree at the University of Technology, Sydney. This was from July 2008 to December 2008. I was assigned to the High Voltage Products division of ABB, which manufactures and installs high voltage equipment such as circuit breakers and disconnectors.

I helped edit the CAD drawings for disconnectors and worked on rough static design calculation, applying the relevant standards. I did these calculations both by hand and by developing excel spreadsheet programs. I was also involved in the CAD drawings for a circuit breaker retrofit at a power station, specifically the choice of cubicle and layout for a control panel. Another project I worked on was to design a control panel for a current transformer to be used in a products and systems display by ABB at the University of Sydney. This involved working with an electrical apprentice to design the circuit and interface of the panel and then purchase the components. This project was particularly informative as I was involved in all stages of the project.

As I worked through the projects that were assigned to me, I had to learn about many areas of business and engineering that I was not familiar with. For example, I needed to learn how to order parts from other companies by following the correct procedure and had to understand and apply standards that were relevant to the projects I worked on. By asking the people around me about their experiences and knowledge, I was able to overcome these problems and as a result the projects were successful.

Power engineers need to consider many factors such as the cost, sustainability, durability and efficiency of a solution when trying to overcome the challenges they face. I saw how products were applied to solve a problem in a manner that allowed the correct balance to be made between these factors. By striving for this balance, the best solutions can be utilised in projects and can help provide stimulus for innovation in the future.

Before my internship, I had very little knowledge of the power industry. As I progressed, I began to see how the various areas of the industry combine to build and maintain Australia's power supply. It was only by seeing areas of the power industry first hand that I could grasp its interconnected nature and how dynamic the power industry really is.

STUDENT: Charrouf Zaher

COMPANY: TRANSGRID



Throughout my Experience in TransGrid under the supervisor of Col Draper senior Project Manager, in the section of Capital Program Delivery (CPD)-projects, I was appointed to manage a project for the duration of my time at TransGrid. My main task was to manage the Munmorah Project, since it is a current project which the construction almost reached its completion date. I had to make sure contractors were on time and made sure all query's and problems were resolved in relation to the completion of the project.

I was able to develop different types of skills in the workplace such as developing my communication skills effectively and efficiently, by communicating with contractors, consultants and Electrical Company's like Delta Electricity. I was able to experience and participate on several occasions in meetings with contractors and discussing the progress of time, scope and cost of the project and any problems that have occurred to be resolved efficiently and productively. I also was able to develop my writing and computer skills effectively and proficiently throughout my time at TransGrid.

My learning experience sky rocketed dramatically and exponentially at a very fast rate. Believe it or not, before joining TransGrid in CPD-Projects, I was surprised by the amount of knowledge I didn't know about and how fast I learned to adapt in this type of environment in the workplace. I was astonished throughout my time of only three months in the workplace, to find out how much I learnt and the amount of professional skills and the knowledge I gained in such little time. It just proves to me that an Engineering Degree doesn't mean you know everything. It's just getting us Electrical Engineering student's prepared for the reality of the workforce and to be able to professionally and competently learn all the necessary knowledge and skills required to succeed in the workplace.

STUDENT: Andrew Palummo
COMPANY: National Electricity Market
Management Company



During a three month period starting on the 3rd of December 2008, I worked as a vacation student for the National Electricity Market Management Company (NEMMCO). I was located at their Norwest Office, working in the Metering and Settlements department, within the actual Settlements team (the Metering team were situated in Melbourne) as an electrical engineering/commerce undergraduate.

During my work placement with NEMMCO I was provided with a couple of projects with several tasks each to help me firstly understand what NEMMCO does as the market operator for the electricity market and secondly help me grasp a better understanding of the functionality and operations run by my department, more particularly the settlements side of my division.

Really being more of the financial side of the power industry, the projects that I was provided were more office based, each involving planning, reporting, designing, reiterating, coding, communicating (i.e. holding meetings, running presentations and delivering speeches), testing and finally rolling out the end product which usually involved distribution and training of staff.

My first project was quite complicated, taking the majority of my time spent at NEMMCO. It involved combining the functions of three spreadsheets (macros) into one primary spreadsheet that more efficiently displayed the results and satisfied several more user cases. The main problem with the previous spreadsheets were that they were unnecessarily slow at executing which was due to inefficient SQL queries and VBA code.

During this project I came across a number of problems my first one being not knowing how to code in SQL or VBA.

My other main problem was improving the running time and getting rid of several errors and other rounding issues that were known to exist from the previous versions. I solved this problem by learning the fundamentals of the SQL and VBA computer languages and utilising some of their supplied functions. Carefully choosing more efficient data sources alongside continuous iteration was how I approached my solution.

In my opinion, this project was great as it allowed me to ask questions about the background information regarding the measured power data and really get a decent understanding of how the money and electricity flow between market generators, retailers, market customers and other power industry participants like Transmission Network Service Providers (TNSP).

My other major project involved customising a SharePoint site for my team to help improve their existing project tracking methods. It was also my responsibility to try and utilise some of SharePoint's other features in making our day to day operations easier to manage and share.

This project was fun in that I've never done anything like building a website before. I learnt a lot from not only SharePoint but the already existing applications that were being used by my team to track and record their data.

Overall, I believe my employment at NEMMCO was valuable and worthwhile.

STUDENT: Kocal Benjamin

The logo for Country Energy, featuring the word "country" in white and "energy" in yellow, both in a sans-serif font, set against a green rectangular background.

COMPANY: Country Energy

Country Energy employed me from the 5th of January until the 20th of February 2009. During my vocation work, I was placed with the network services team as an undergraduate electrical engineer trainee.

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

- Develop a greater understanding of the distribution of electricity and the workings of the power network.
- Learn of the challenges faced by, and role of, engineers in the power distribution field.
- Become aware of electrical-power standards and safety measures in place.
- Gain a greater technical understanding of power engineering.

During my placement I was able to work in many different substations and gain an insight into the technology used for distributing electricity. I was able to observe maintenance and testing on several substations while on placement. This reinforced ideas and concepts taught at university. Should I ever go into power-design engineering the knowledge gained from seeing a transformer dismantled, and insulators, fault-thrower fuses, and circuit breakers tested, would be invaluable. Also, seeing the new, more effective, silicone-rubber insulators replace the aged ceramic ones was a timely reminder of the constantly evolving field. Watching nu-lec re-closers, which automatically fed up-to-date data to network operations, installed and running in substations proved the budding nature of power engineering and the importance of engineers. In saying this, I was given the opportunity to assemble and then operate a nu-lec re-closer. This enabled me to see the bare roots and design of such a complex machine. In addition, these experiences and Country Energy's training allowed me to become more aware of electrical safety principles and electrical standards in place.

While with Country Energy I also learnt the basics of CAD while drawing the plans for three new regulators being replaced at a remote substation. This allowed me to improve technically, and I was able to see the importance of the equilibrium between CAD and the physical replacement of such electrical devices. Furthermore, I was able to visualise the distribution system and see in practice how power losses in transmission lines are dealt with. Thus, the willingness of Country Energy employees to share their knowledge and explain new concepts was truly beneficial.

In conclusion, the placement proved extremely valuable to my understanding of power engineering and enabled me to improve my technical and practical skills immensely. Travelling to the many substations in the Riverina region of NSW allowed me to develop a greater understanding of the work of power engineers. Consequently, the experience has allowed me to gain vital knowledge into electrical safety and standards, power engineering, and the workings of the electrical distribution network.

STUDENT: Wykes Christopher

COMPANY: MACQUARIE GENERATION

Over the 2008/09 summer holidays I attended Industrial Work placement at the electricity generation company Macquarie Generation. I was placed at Bayswater Power Station in the Upper Hunter where I worked for 10 weeks under the guidance of electrical engineer Trevor Woolley. This report will detail the problems I faced, the work I undertook and the knowledge I gained throughout my placement.

At Bayswater Power Station I worked in the Electrical Power Systems (EPS) section. As their name suggests EPS team is in charge of maintaining the AC electricity supply that powers the motors and protection devices that keep the station running. They are also in charge of the company owned transmission lines that deliver power to the external parts of the plants such as the river and ash pumps.

Recently Bayswater had upgraded various parts of their plant and were in the process of building a new river pumping station. This meant that their current electrical model of the power plant needed to be modified to account for the changes. It was my job to use electrical modelling software to update the electrical drawing. This entailed me going out to different parts of the plant and collecting data of the new equipment or measuring distances of new power lines. In some cases I was able to collect the information off drawings and use them. Once all the details had been gathered the devices were added to the model.

Aside from modelling the electrics of the power station I was also required to work on the installation of new parts of the plant. This involved recording control and protection connections in preparation for the new 500 kV transformers that Bayswater is currently installing. I also was tasked with developing instructions for installing new circulating water pump coolers. This involved working out voltage drop calculations for connecting cables and circuit paths for these cables to follow.

While working there I also performed several smaller jobs involving electric battery calculations and the like.

STUDENT: Ley Matthew
COMPANY: ENERGY AUSTRALIA



For 12 weeks between the 8th December and the 27th February I was employed as a work experience student for Energy Australia. During the 12 weeks I worked at Head Office Building in the Distribution Planning Section as an undergraduate electrical engineer.

The following are the objectives that I set myself for my work experience:

- To gain experience working for a power company
- To learn about the types of problems electrical engineers solve
- To complete a task without gaining assistance
- To gain more knowledge about electrical engineering
- Gain in depth knowledge of electrical transmission

While working at Energy Australia I complete multiple jobs on the 11kV distribution network. The first job I completed was a HV-Connection. This involves firstly checking to see if the new kiosk style Distribution Substation can be supplied from the existing electrical network, then drawing up electrical and geographical plans for the kiosk. For this job I had to use multiple tools to assist me in my job. Over my 12 weeks I completed multiple HV-Connections in the North region which was the area I was assigned to. The other type of job I performed was a Distribution Network Project (DNP). This was a major job. The problem given to me was multiple feeder panels at Castle Cove Zone Substation supplying its surrounding areas were potentially overloaded at times of peak loading. Working with a partner to help me out we had to come up with a solution to fix the problem that was the most efficient and cheapest. Using similar tools as HV-Connections as well as multiple site inspections to see if our plans could be put into practice we completed the project just before my 12 weeks was finished. While working at Energy Australia other employees often took me on site with them to zones. This was useful as I gained a greater understanding of how the electrical network worked and techniques used to make the network more efficient.

Throughout my employment at Energy Australia I was able to complete my objectives that I set. Working on the 11kV distribution network I was given the opportunity to enhance my knowledge of the distribution of electricity as well as improved my computer skills which will greatly assist me throughout my university degree. Overall my vocational work experience at Energy Australia was a great educational and practical experience for me.

STUDENT: Rizwan Raza
COMPANY: TRANSGRID



I was employed by TransGrid through the API during the interval of December 1st 2008 until February 20th 2009 as an undergraduate electrical engineer. I then personally extended this placement until the 6th of March 2009 on a full-time basis then one day per week part time until April 6. I have been stationed in the Network Performance and Operations group wherein I've been placed in Asset Performance working in Transmission Systems under Transmission Systems Engineer Richard Archer.

The Asset Performance group works to maintain all of TransGrid's assets at optimum efficiency. I have been chiefly working in Transmission Systems. Richard has involved me with every project that has unfolded throughout the summer. These are outlined below.

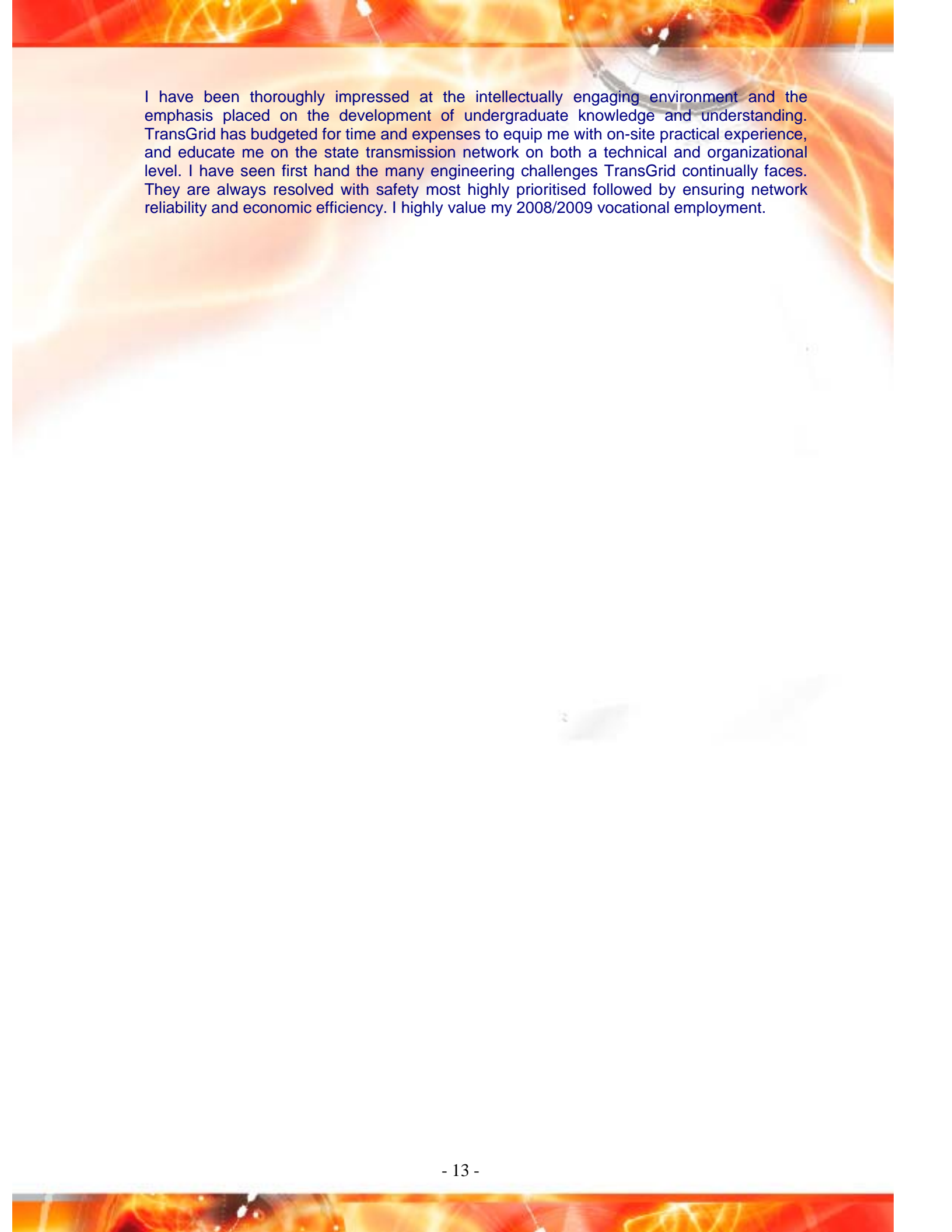
I assisted a graduate engineer on the analysis of the steel structures on 8-line near Dapto substation. We conducted a series of tests to model the rate of corrosion on steel towers embedded in the ground along with their sacrificial anodes. Ultimately, the objective was to formulate new data measurement standards for our steel structure maintenance and replacement policies. Prior to this project, TransGrid followed an industry guideline considering -850mV tower leg potential and 50mA anode current output value as acceptable (current is due to the contact between two metals of differing electro-negativity: normal oxidation/reduction processes). We concluded that our standards need to be altered to more suitable levels. This project's complexity lay in various factors, which threatened the accuracy of our results. One included the fact that Dapto substation's copper earth grid was in the vicinity and could have possibly interfered with measurements. All uncertainties were considered and a final document was made by a fellow engineer detailing a new suggestion for our anode testing values.

I also participated in the examination into the cause of various wood pole failures along 132kV line 94U: Parkes to Forbes. The cause was determined to be drying out of the wood and a severe wind storm was sufficient to knock it over.

I observed the development of a "real time ratings" project which uses wind speed and temperature data in an attempt to dynamically alter a line's rating. This project is in testing phase.

Overlooking all of these smaller tasks, my main role was to complete a detailed examination of every line owned by TransGrid and finalise their age. This involved becoming literate in searching through a few of TransGrid's programs including "Tamis" (map of all lines) and "EDMS". I searched through various documents (line schedules, easement plans, line data sheets, data cards, etc) and put this information into a spreadsheet. Using this information I made an accurate estimate of the age of each line. Richard Archer will use this knowledge to perform an asset re-valuation in which these assets will be assessed as either economically productive or unproductive.

In addition to all of this experience, I have learnt valuable information under the tutelage of the engineering staff. I have been to various substations and important locations throughout the state including: Sydney West substation (gathering data/tour), Ingleburn substation (investigating transformer bushing failure/tour), Haymarket substation (extensive tour), Beaconsfield substation (tour), Blue Mountains (tour of lines), Orange (pole failure), Prestons (weather station installation), Dapto substation and local lines (anode testing), underground Sydney MetroGrid tunnel (which runs from Sydney park to Haymarket substation).



I have been thoroughly impressed at the intellectually engaging environment and the emphasis placed on the development of undergraduate knowledge and understanding. TransGrid has budgeted for time and expenses to equip me with on-site practical experience, and educate me on the state transmission network on both a technical and organizational level. I have seen first hand the many engineering challenges TransGrid continually faces. They are always resolved with safety most highly prioritised followed by ensuring network reliability and economic efficiency. I highly value my 2008/2009 vocational employment.

STUDENT: Alcaro Robert

COMPANY: TRANSGRID



My 2008-2009 vacation work experience placement was with TransGrid. TransGrid is responsible for the high voltage electricity transmission network within New South Wales moving the power from power stations to cities and the various energy distributors. I was employed with TransGrid for 13 weeks between 25th November until 20th February in their Capital Program Delivery/Projects division.

While with TransGrid, I was placed to work on a number of projects the company was undertaking. The main project I worked on was the Aerial Laser Survey (ALS) project in which the transmission lines and substations in the network were being flown over by a helicopter and surveyed using a laser system. The data collected would then be processed and matched up against existing transmission line and substation drawings, so that a computer model of the network's assets could be constructed. It was my job to find and interpret missing drawings and provide this information to the consultants completing the work. The work involved a mix of searching, integrating and interrogating data from online drawing databases, reviewing line data cards and existing drawings marked up on construction. While many drawings were easy enough to find, many provided their own challenges as transmission lines may have been modified and rearranged over the years. This required me to fully understand the data and the data deficiencies. As a result, the process allowed me to make a field trip to the Yass regional office to ascertain the latest information for various lines in the Southern region of the state. In the process I needed to accumulate the data to facilitate the objectives and optimise the collection process and the presentation of the data to the needs of the project. I was also able to be involved in many other projects which exposed me to other processes in project management such as writing project plans for various projects, using spreadsheets to calculate budget data on projects for the next five years and the tender evaluation process.

Through my employment with TransGrid I was able to learn a lot about the electricity transmission network as well as what is required to keep the network up to date through various projects. The various types of projects I was exposed to allowed me to greatly expand my technical knowledge with practical real world applications. I have gained an understanding of how reactive and active power can affect the system as well as many project management skills which as a first year student have not yet been exposed to at university. I was also able to expand my knowledge of Microsoft Excel as well as learning how to use many of TransGrid's internal applications. As well as all the technical skills I acquired from this employment, it also showed me that everything we learn at university has a practical application and has further motivated me to strive for excellence in my studies. The vacation employment was a worthwhile and invaluable experience.