# Executive Summaries

## 2012-2013 Bursary Vacation Placements in Queensland

### List of Executive Summaries

<table>
<thead>
<tr>
<th>Student</th>
<th>Company</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bailey, Michael (QUT)</td>
<td>Powerlink Queensland</td>
<td>2</td>
</tr>
<tr>
<td>Diverall, Bradley (QUT)</td>
<td>Powerlink Queensland</td>
<td>3</td>
</tr>
<tr>
<td>Forsyth, Sebastian (UQ)</td>
<td>ENERGEX Ltd</td>
<td>4</td>
</tr>
<tr>
<td>Francis, Alistair (UQ)</td>
<td>Powerlink Queensland</td>
<td>5</td>
</tr>
<tr>
<td>Jess, Adrian (UQ)</td>
<td>ENERGEX Ltd</td>
<td>6</td>
</tr>
<tr>
<td>Sharpe, Stuart (UQ)</td>
<td>AEMO</td>
<td>7</td>
</tr>
<tr>
<td>Thompson, Mark (QUT)</td>
<td>PB Power</td>
<td>8</td>
</tr>
<tr>
<td>Wong, Tik Son (UQ)</td>
<td>ENERGEX Ltd</td>
<td>9</td>
</tr>
</tbody>
</table>

### 2012 Bursary Holders

<table>
<thead>
<tr>
<th>Student</th>
<th>Company</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eden, Samuel (QUT)</td>
<td>ENERGEX Ltd</td>
<td>10</td>
</tr>
<tr>
<td>Smith, Reuben (COU)</td>
<td>NRG</td>
<td>11</td>
</tr>
<tr>
<td>Varendorff, Jeremy (QUT)</td>
<td>ENERGEX Ltd</td>
<td>12</td>
</tr>
</tbody>
</table>
Over the summer of 2012/2013 I worked as a substation automation design vacation student for Powerlink, at the Virginia Head Office. My decision to work in automation design for my second vacation placement was due to my preference towards the technical design aspects of engineering. It is this style of engineering that inspired me to commence my degree in electrical power systems engineering.

The purpose of this report is to explain how I achieved my objective of further developing my engineering design skill, project skill and knowledge of IEC 61850 substation design standard. This report does this by elaborating on 7 projects/engineering tasks that I contributed to over the summer:

- VBA programming for IEC61850 GOOSE Matrix Checking
- Swanbank B 275 kV Switchyard Replacement – Stage 5
- Geo-magnetic induced current monitoring scheme for North Bowen Substation
- Pioneer Valley transformer replacement
- Queensland Rail Static VAR Compensator defect
- CQ-SQ Special Protection Scheme
- Ross Substation AC essential Supplies

This report will also discuss the tools and methods that I used to produce these designs and enhance my core engineering competencies. These competencies include interpreting and developing design requirements of projects. An example of this was working with a protection engineer to develop the protection signalling between Greenbank and Blackwall.

This summer also saw me develop my programming skills. I wrote a VBA program that is capable of detecting discrepancies between the settings files of Intelligent Electronic Devices and the original setting data used to program these devices. Having no previous experience of programming in VBA language, I adapted the knowledge that I gained from other languages that recently I learned at university to complete this task.

Throughout the summer I was also provided with support of other substation designers and engineers to deliver workable solutions. I frequently used SAP, Objective, SPF, Microstation and standard office software to complete projects. I believe that I have further developed my engineering design skills over the summer and am grateful to Powerlink for providing me with this opportunity.
During the summer of 2012 to 2013, I was given the opportunity of working as a Vacation Student Engineer at Powerlink for 12 weeks. Through this report the knowledge and experience that I gained over the course of my vacation placement will be discussed, in addition to work that was conducted.

My placement at Powerlink was my second exposure to the power industry, broadening my understanding of the industry. I was privileged to work in the Main Grid Planning group located within the Investment and Planning division. During my time spent at Powerlink I was tasked with creating a tool to enable Planning Engineers to assess the performance of sections of a bus bar against the overall bus rating. I spent the majority of my time working with the Python programming language and the Power System Simulator for Engineering program. For part of the project I learnt about various substation topologies, especially the breaker-and-a-half layout, and different types of network diagrams used by the planning teams. During my project I also chose to seek assistance from various professionals around Powerlink, as I found their experience can be invaluable. By the conclusion of my placement the code that I developed fulfilled the majority of the requirements; however it lacked the ability to run contingency studies.

The vacation placement has been invaluable in providing a window into the workings of an electricity transmission company, greatly increasing my knowledge over the course of my employment. Working in the planning division was a completely new experience, and one that I found to be both valuable and enjoyable. I now have a far greater understanding of various tasks required for the planning teams at Powerlink, and how they relate to the overall operation of Powerlink. While I realise there is still a significant amount of knowledge that I have yet to gather, my time at Powerlink has greatly improved my understanding of many areas in the power industry.

I would like to thank all those who I was involved with at Powerlink for making this an invaluable vacation placement.
This report aims to provide a summary of my vacation employment with Energex, a Distribution Network Service Provider (DNSP). The experience gained over this period has been very beneficial in both my professional and personal development as an electrical engineer.

Energex distributes electricity to South-East Queensland. Within Energex, the Future Technology Development Department looks at implementing new technologies into the current network with an aim of improving the performance of our electricity network and quality of supply. This is done in order to compensate for future needs such as embedded generation from photovoltaic cells (PV) and new loads such as electric vehicles.

The current SmartGrid trial used PoweRline Intelligent Metering Evolution (PRIME) Power Line Carrier (PLC) and static synchronous compensators (STATCOMs). These devices provided monitoring at individual customer’s premises and managed the power quality of the low voltage feeders respectively.

Baseline data prior to the commencement of this trial was analysed using Microsoft Structured Query Language (SQL). Analysis of various aspects of power quality reporting, PRIME communication performance and customer voltage delivery as per the Australian Standard was completed over the period of employment.

The valuable experiences over this period included gaining a clear understanding into the methodology development and implementation of new technologies; developing an understanding of the Energex network as a whole; discovering the changes which can occur in the industry; delivering a professional technical seminar in SmartGrid Data Analytics; and the emphasis and importance of personal safety in the industry.

I would like to thank the Australian Power Institute for the opportunities it provides young engineers to further their development in the power industry throughout Australia, and Energex for opportunity to work with the Future Technology Development Department over the 2012-13 summer vacation period.
I was privileged enough to work at Powerlink Virginia at the end of 2012 and the start of 2013. In their own words, Powerlink “owns, operates, develops and maintains Queensland’s high voltage electricity transmission network” (Powerlink Queensland 2011). I was situated in the Secondary Systems Asset Strategies department.

While I worked at Powerlink I was assigned multiple tasks from the secondary systems asset strategy team. These tasks ranged from updating design policies and writing project scopes to auditing the data in their SAP ECC6 database. To accomplish these tasks I was required to talk to colleagues from all over Powerlink from engineering to IT support. This allowed me to discover how the business functions work and to gain insight into the different roles that are required to manage a business of this size. I also learnt how to use SAP ECC6, SmartPlant Foundation (Drawing Management System), Objective and very advanced excel functions and coding.

I also communicated with external companies, one being Global Reliability, to understand how to use their software which allows the use of a different method of reliability analysis. The other company being OSIsoft, which Powerlink was investigating using for a Phasor Data Concentrator (PDC), to better interact with their installed and future Phasor Measurement Units (PMUs).

My time working at Powerlink was an incredible experience. I learnt how electricity is transported from generators to customers and then to households. I learnt how the electricity market functions and what governs the price of electricity. I experienced how such a large engineering company operates and how all of the employees fit together. I also learnt how engineers can access and use data and how data integrity is so important to asset strategists. I also experienced office etiquette and procedures, such as weekly meetings.

My time at Powerlink Queensland has sparked my interest in Electrical and Power Engineering. I can’t thank the API and Powerlink Queensland enough for giving me the opportunity of a life time and letting me work there over the summer break of 2012/2013.
I was privileged enough to get vacation work at Energex which is a power distribution company. My placement was from the 26/11/2012 till the 08/02/2013. During this time I undertook a wide variety of tasks and got to experience both the Engineering Services team and Mains Design team, which make up a large part of the service delivery department. The Mains Design team is mainly involved with design, development, planning and augmentation of Energex’s 110kV, 33kV, 11kV and low-voltage overhead and underground wires. Whereas the Engineering Services team deals with managing the delivery of the substation design from pre-approval through to design completion; it also supports the project during construction and design reconciliation phases.

Some of the tasks I undertook whilst with these teams where: document mark up, Earthing Studies, Direct Lightning Protection studies as well as overhead and underground cable design, planning and augmentation.

Overall I found this experience very valuable as both my technical understanding and professional skills where greatly improved by this experience. I now have a greater understanding of our transmission network and some of the work that goes in to maintaining and upgrading it.
From November 2012 to February 2013 I worked at AEMO within the Network Development group and specifically within the Supply Forecasting team under the supervision of Nathan White.

It has been an extremely rewarding experience and each day I have learnt more about the industry and the unique challenges facing it. It is an industry in transition, from the daily coverage in the media, increased scrutiny from governments, privatisation and climate change.

The group I worked in has a long term focus to ensure reliability and security for the NEM and the role of the supply forecasting team is forecasting the availability of Gas and Electricity supply.

Projects I undertook whilst at AEMO were varied and included looking at how Unserved Energy is modelled and quantifying the confidence we have with the results. Investigating the suitability of wind turbines based on historic wind information by calculating the capacity factors at different locations. Examining how we classify gas reserves and the impact this has on our modelling. I also looked at how data was being used by the Network Development group and how to consolidate our sources.

In addition to these projects I worked with others in the group supporting projects they were working on such as Minimum Reserve Levels (MRL) studies, the Heywood interconnector and the Electricity Statement of Opportunities (ESSO).

I would like to thank AEMO for the opportunity to work with them and for the invaluable experience provided. The placement kept me busy and provided me with interesting projects to work on.
Over the 2012/2013 summer I was employed by Parsons Brinckerhoff as an undergraduate electrical engineer in its Power Department in Brisbane.

I was given the opportunity to work on a number of projects during my employment. The largest of these was a proposed energy from waste (EfW) power station, where waste is diverted from landfill and used to generate electricity. Other projects I worked on include modelling solar PV power stations using PVSYST software and contributing to a feasibility study for a transmission line in Papua New Guinea.

I also learnt many soft skills during my time at Parsons Brinckerhoff through participating in team meetings, working with clients, and meeting deadlines.

The experience has been extremely valuable in providing me with an insight into the engineering profession and has helped me in my career path of becoming a Power Engineer.
In the summer of 2012-2013, I undertook a three-month work experience with Energex as an undergraduate Electrical Engineer. During my placement at Energex's Newstead corporate office, I was allocated to the Network Development and Strategic Planning (NDP) group, which is a subgroup of the Asset Management Division.

The experience of working in Energex allowed me to appreciate the role of the power industry and the responsibilities of a professional Electrical Engineer. During the vacation work placement, I have furthered my understanding of the network development planning process, and have gained an overview of the associated concepts such as network limitations and security standards.

Having completed just two years of my undergraduate degree, I was pleased to be assigned a range of learning exercises to familiarise myself with the sub-transmission and distribution networks, and software tools and databases used in the network development planning process. Most of the tasks assigned to me throughout the placement were formative towards the compilation of planning reports. These tasks provided me with ample opportunities to develop and practise knowledge and skills in utilising power system simulation tools, distribution network management systems, substation investment forecast tool and spreadsheets. An enhanced understanding of the electricity transmission and distribution network and of the skills involved in the network development planning tasks allows me to feel more capable of undertaking further development at university and in the engineering profession in the future.

I would like to extend my gratitude to the Australian Power Institute and Energex for providing me with the work experience in the 2012/13 Summer Vacation Engineering Placement Program. The position undertook in the NDP was rewarding as I have achieved valuable knowledge related to various aspects of the power industry which will be highly constructive towards the future development of my career as an Electrical Engineer.
The Australian Power Institute and ENERGEX Corporation provided the invaluable opportunity of employment within the Switchgear Maintenance and Maintenance Planning divisions. This provided insight into the engineering profession alongside an enhancement of technical understanding and appreciation of the power industry and network.

ENERGEX is Queensland’s major electricity provider and therefore the maintenance of its assets, such as high voltage switchgear, is of great concern. The high voltage switchgear is susceptible to the onset of partial discharge, which may invoke failed insulation and plant failure. The first period of employment involved learning the concepts behind partial discharge, using developing technologies to detect this phenomenon and create suitable conclusions and recommendations.

My subsequent works involved developing programs to assist the Maintenance Planning division, which is responsible for the replacement, monitoring and refurbishment of all Energex’s assets, which are worth a total of approximately $8.8 billion. Consequently, vast amounts of data management is required and developing programs provided the opportunity to optimise projects, increase efficiency and assist in determining the most practical solution.

The employment allowed my conceptual understanding, problem solving skills, management, organisational and communication skills to be greatly enhanced, which will greatly assist future studies and career endeavours.

Again, sincere gratitude and appreciation should be awarded to the Australian Power Institute and the ENERGEX Corporation and staff for presenting the opportunity for Engineering Student Vacation Work over the 2012-13 summer.
The purpose of this report is to detail the information relating to the engineering placement undertaken by Reuben Smith during the 2012-2013 summer university vacation period. During this time (approximately 12 weeks), I, Reuben Smith, was employed with NRG Gladstone Power Station in the Technical Services (Mechanical) department of said organization.

This wonderful opportunity that was bestowed upon me has shed light on the field of engineering in ways I could not have imagined; particularly in the areas of power generation, mechanical maintenance and project planning. The challenges I faced on a daily basis allowed me to conceptualize a variety of engineering methods used to solve problems, overcome setbacks, and work amongst a group of dedicated professionals to ensure that the operating systems of NRG Gladstone Power Station remained at full functionality and efficiency levels.

When encountering a problem or task which demanded more than what my current level of knowledge could provide, I was able to take initiative in conversing with other professionals (engineers, tradesmen, managing sectors) to ensure that potential solutions would be able to sustain the technical capabilities of the power plant. This gradually built up my confidence to a level which allowed me to express my ideas and concerns to others without the fear of seeming inadequately educated for such a task. The notion of teamwork was strongly emphasized throughout the duration of my work placement, with no project or task, however small, requiring the input of a sole individual. This was critical in allowing me to develop a greater appreciation for team-based learning, and how to work with people of different disciplines in order to produce a final deliverable.

Working at NRG Gladstone Power Station for such an extended period of time, as well as having the guidance and reassurance from numerous professionals in the power industry has allowed me to get a foot in the door this year in terms of returning to my studies with a new and improved mindset on what it is like to be an engineer. The adaptability, technical understanding, problem solving capabilities and confidence that I developed during my time at the power station will give me a head start this year, and allow me to view my projects from angles and perspectives that would have otherwise remained unknown.
This report provides a brief summary of my experience as a vacation student at Energex. As an Australian Power Institute bursary holder I was privileged to partake in valuable industry work experience over the 2012-2013 summer holiday period after completing my first year of engineering studies. I was placed at Energex in the Reliability and Power Quality Department, located within the Asset Management Division at the Newstead office in Brisbane. Over the duration of my placement I was exposed to and gained an appreciation of the Energex network and the many reliability and power quality issues currently facing it.

Energex’s Power Quality team aims to ensure that the quality of electricity supply received by all customers meets regulatory requirements in regards to steady state voltage, voltage unbalance, fluctuations and distortion. Over the course of my placement I was involved in a number of tasks relating to power quality. These tasks included performing assessments on photo voltaic installation applications, conducting research on battery bank compatible grid connected inverters and data collection/entry of network connected embedded generators.

My placement at Energex was a very rewarding learning experience and through it I have achieved a number of outcomes. I have contributed to the Power Quality Team’s objectives as outlined the vacation placement report. I have made numerous professional contacts who I can call on for advice with regards to study, career direction and job prospects. I have gained valuable insight into the power industry and how it operates. Furthermore, my research, organisational, communication and technical skills have significantly benefited from my experience at Energex and as a result I am now better equipped to advance my studies and profession in the field of electrical engineering.