Executive Summaries
2012-2013 Bursary Vacation Placements in Tasmania

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My name is Sophiya Patel. I am currently in my fourth year of Electrical Engineering at University of Tasmania. Over this summer period, I had the chance to work at Hydro Tasmania, as a vacation student for seven weeks (from the 12th of November 2012 to 8th of January 2013). Hydro Tasmania deals with the generation of electricity state-wide. They are Australia’s leading clean energy business. I was assigned to the Energy Control System (ECS) Team of Hydro. The objective of this group was to manage the SCADA (Supervisory Control and Data Acquisition) systems and deal with critical production system issues.

As part of this group, I didn’t have any particular project to work on but I had to learn the processes involved in the ECS team and what they do on a day-to-day basis. This team had been more concerned with the electrical communications side of things rather than with electrical power. But this opportunity still gave me an understanding of the SCADA systems and how the power systems are managed.

Since the ECS team dealt with the SCADA issues, I was able to learn about how SCADA systems work and how crucial they are for the purpose of gathering data on all the equipment present at power stations. Hydro Tasmania has numerous power stations established all across Tasmania that help to generate electricity via renewable means and that energy is then fed into our grid. Each of these power stations, have various equipment like generators, transformers, circuit breakers, travelling crane, penstocks, etc.

This is where SCADA and the ECS team come in use. Considering the fact that so many things need to be monitored within a hydro power plant, such as temperature alarms, fire alarm, machine alarms, etc, the SCADA system is crucial for the daily functionality of all the power stations. So to monitor the equipment, alarms/sensors are placed at appropriate locations within the power station and the ECS team receives a scan-list, which contains information regarding all the possible alarms placed in a power station. The number of alarms can vary from as little as 50 alarms to 1000 alarms and above.

So my main job for the duration of the work had been to put these alarm points from the scan-lists to the production (live system) source database. By putting the points into the database, they become linked to the RTU (Remote Terminal Unit) on site. After these points are put into the system, commissioning is carried out to check that all the points are in the system and there are no issues. For commissioning, a trained
professional has to physically trip the alarm points at the station and someone from the ECS team observes that all the alarms are getting tripped appropriately and that all the information that shows up on the screen is correct. I was also able to commission points for a few of the power stations that had been upgraded.

As part of this placement, I had been provided with a different experience as to how engineers work in ‘real life’ and I acquired a lot of knowledge particularly about how the generation side of the business functions. I also had the chance to network with numerous people in different fields, including the Technical and Operations, Generation, Spot Trading System, etc. This was really useful as I got a broad range of how the many different units function and together they produce such amazing results.

In conclusion, this had been a great experience and I enjoyed doing this work. I would like to thank the ECS team at Hydro for allowing me to share their workplace and I would also like to thank the Australian Power Institute and Professor Michael Negnevitsky for their support in the last 2 years.
STUDENT:   Stuart Ednie (UTas)
COMPANY:   Transend Networks

My name is Stuart Ednie; I am an Australian Power Institute Bursary recipient. From November 2012 to February 2013, after the completion of my third year at the University of Tasmania, I spent 12 weeks at Transend Networks where I worked in the Protection and Control team in the Engineering and Asset Services group. I had worked in this team previously, and really enjoyed my second season of vac work, as I was able to participate in much more challenging work.

Transend is the only power transmission company in Tasmania, and as such are responsible for all the related infrastructure. This includes the Trans-lines themselves, the transformers and (most importantly for P&C) all EHV and HV feeder switchgear. Transend's job is to provide a safe, secure and reliable transmission system to transport high-voltage electricity from generators to the distributor and some major industrial customers.

I was lucky enough this summer to participate in several projects I was solely tasked with, and even organize field work. The job that's best sums this up was a Protection settings review I did at the Lake Echo power station. This involved checking the suitability of the existing protection settings for the transmission lines between Lake Echo, Waddamana and Tungatinah as the physical arrangement of the lines had recently changed here. This job involved quite a lot of technical office work, however, based on my findings, field testing was warranted. This was organized in cooperation with hydro Tasmania, as all equipment at the power station was there responsibility. The job ran very successfully and I was quite proud to be part of such reverent and vitally work.

I had the opportunity to work with several very talented engineers at Transend Networks, and I would like to thank both them, and the API for organizing this opportunity to stretch my legs in a real engineering environment.
STUDENT: David Skinner (UTas)
COMPANY: Hydro Tasmania

Over the 2012/2013 summer I was lucky enough to complete my Industrial work placement at Hydro, the main body responsible for power generation in Tasmania. Hydro is government owned and employs around nine hundred people. Hydro Tasmania uses both wind and water to generate power into the National Energy Market and is the nation’s largest supplier of renewable energy. Working at Hydro provided me with an experience uniquely different to Transend and Aurora as I had exposure to mechanical engineering elements rather than just the electrical perspective.

After a brief induction I was encouraged to head out onto site with various engineers, often staying overnight. As there were several outages happening in various locations we took advantage of the chance to climb inside a few of the larger generators (alternators) and inspect the windings.

One of the inspections was at Fisher Power Station in the states central north. The windings on this particular machine are fitted with sensitive vibration sensors. Prior to a past the machine outage increased levels of vibration had been noted and so extra packing had been installed. During our inspection we checked all the extra packing for rigidity and the end windings for vibration. Technicians had already conducted some electrical testing which indicated areas of concern for partial discharge. The windings are contained in small confined spaces so some parts of the inspections are a bit challenging however the use of small cameras helps. The windings are heavily insulated but the high voltages still leads to partial discharge which can eventually lead to fire and machine failure. Small levels of partial discharge were visible in the expected locations however it was deemed that the insulation and windings were in good enough condition to be run hard for another couple of years without major concern.

Over the following weeks we conducted several more inspections around the state without any significant problems found. Some minor insulation repairs were done while I was at the Gordon power station by adding extra epoxy glue/paint to the windings. During this time I went through several inductions and was able to watch other mechanical works being undertaken as well as gaining a further understanding of how the larger systems operate.
Another significant task that I undertook involved assessing tenders submitted to hydro for the supply and delivery of a new 160MVA transformer. The two main considerations to be accounted for were cost/efficiency and compliance to the technical specifications.

The initial cost was surprisingly hard to determine as each tender broke the project components down in different ways with various fees and charges within quite lengthy and tricky documents. The transformers efficiencies can be used to calculate how much revenue would be lost over the expected lifetime for each design then assessed using Net Present Value. The combination of costs was totalled, showing a significant leading candidate.

The next step involved making detailed comparisons of each proposal against the specification requirements stipulated by Hydro. The variations I found varied and appeared significant. One transformer’s per unit impedance was shown to be 1% above the desired specification. If this design was chosen it would probably require new fault level calculations for the associated system and bus. Other variations included; tap levels, delivery times, tank mounted radiators, fully welded lid types, zero sequence impedance and temperature sensor contact differentials. It was challenging to determine what differences were significant and which were minor. Other considerations included warranties, brand histories, the number of each brand in service and the maintenance requirements.

Finally without much experience in the field I was poorly positioned to value or rate the significance of the tender selection considerations and so I spoke in detail to Hydro’s transformer specialist before making my final recommendations.

Other tasks included assisting in writing and editing training manuals for system components, inspecting brush gear components on alternator excitation systems, learning about and problem solving governor control systems, LSConfig programming for Allen Bradley PLC’s and checking for generator speed control signal mismatch solutions.

Overall I learnt a lot from my vacation work and would like to thank Aurora Energy, Transend Networks, Hydro Tasmania, the Australian Power Institute and Professor Michael Negnevitsky for the opportunities and look forward to further experience in the future.
My Name is Lukas Krellmann and I was lucky enough to receive the Australian Power Institute Bursary in 2011. In the summer of 2013, starting on the 17th of December 2012 and finishing on the 15th of February 2013, I was able to do my first eight weeks of vacation work with Hydro Tasmania. I was given a position in the business development team and was supervised by Marian Piekutowski. This was a great opportunity to see what goes into the development of a business and typical day to day practise of a design team, and gave me my first actual experience as to what a job as an engineer would really be like.

The two main developments that I was able to work on were the planning of the new 600MW TasWind wind farm and HVDC underwater connection to Victoria proposed to be on King Island and the Diesel uninterruptable power supply (DUPS) commissioning on King Island. In addition to this a later task was to develop a load curve model for remote power systems similar to systems seen on King Island. The TasWind tasks were minor and only included developing an information paper regarding possible dangers of electromagnetic radiation created by the power transmission infrastructure required for such a large wind farm as well as educating myself in possible wind turbines used and power transmission. The task that I would spend most of my time on was the commissioning of the DUPS system on King Island which is designed to help King Island reach near zero diesel operations, by running the DUPS in synchronous condenser mode and stepping it up to generation mode when wind resources are low. The tasks included analysing large quantities of excel data and summarising it into a more compacted form to be put into a folder used by Marian. This task to me was incredibly daunting as it was the first time I actually had to do something that would be quoted by someone much more experienced to other engineers meaning there was little room for error or writing up wrong information. In addition we were also given the task to produce a plan on further testing of different governor settings, which was again quite scary due to the fact that it was in my hands to play around with Hydro resources. Luckily Marian, though incredibly busy, could always find time to answer even the most basic of questions. The Final major task that was given to me was the design of a load curve for a remote off grid power system. Hydro could use this curve to approximate, given specific user inputs, the power requirement of a community and hence design a solution to their needs. This model was meant to be used to help reduce diesel usage of remote communities by implementing renewable power generation solutions.
In addition to the in house office work I was able to do, I also got the chance to have a look at one of the projects Hydro Tasmania has developed with a field trip to the Mussleroe Wind Farm in the North East of Tasmania. The trip was designed to show Farmers and community members of King Island what sort of impact a large Wind farm might have on the environment, though for me it was more an opportunity to see the working of a wind farm, which was very interesting.

I would like to Thank Hydro Tasmania for giving me this opportunity I would also like to thank Dr. Marian Piekutowski for supervising me during my time at Hydro and Professor Micheal Negnevitsky and the API for making all of this possible.
After completing second year studies as an electrical power engineering student I spent 10 weeks, between December 2012 and February 2013, as a vacation student in the Business Development department of Hydro Tasmania.

Hydro Tasmania is the Australia’s leading supplier of renewable energy and the largest manager of water. They generate most of Tasmania’s electricity from the many Hydro-electric power schemes across the state.

The Business Development department mainly looks at ways Hydro Tasmania can grow and expand and the main focuses during my stay were twofold:

Firstly, the King Island Renewable Energy Integration Project (KIREIP) which has the objective of reducing the reliance on diesel generators on King Island and increasing energy supplied by renewable energy, which is mostly wind. Currently, during high wind conditions King Island can be solely supplied by the energy generated by the wind turbines. Overall, renewable energy contributes approximately 65 % of the energy generated on the island. The goal is to continue to reduce the amount of diesel used for electricity generation.

Secondly, the TasWind concept, which is a longer term idea of constructing a 600 MW wind farm on King Island (this would be the largest wind farm in the southern hemisphere) and connecting this with an undersea cable to Victoria, to supply the energy generated onto the Victorian grid.

During this time I did some research into possible high voltage direct current (HVDC) connection and converter technologies to connect TasWind on King Island to Victoria.

After this, I and fellow API student, Lukas Krellmann, interpreted data relating to various tests that were undertaken on diesel generators and diesel uninterruptible power supply (UPS) machines on King Island. These tests were important as part of KIREIP as the diesel UPS system increases renewable energy penetration generated by existing wind farms on King Island and reduces the amount of diesel needed.

A third task was the developing of a model to be used for remote area power systems. The initial idea is based on what is currently present on King Island (itself a remote area power system, as it is not connected to the grid), however, the model is intended to have the flexibility to be able to be used virtually anywhere in the world. The model involved various load profile curves based on different types of loads such as residential, commercial and industrial loads of different varieties. The model included
variations in load due to weekends and seasons and allowed for the possibility of drops in industrial loads due to a yearly maintenance shutdown, for example.

I also had the wonderful opportunity to visit the under construction Musselroe wind farm, consisting of 56 wind turbines (168 MW), in the North East of Tasmania. This was an incredible and enjoyable experience, to see the size and extent of such a large renewable energy project.

I thoroughly appreciated my stay at Hydro Tasmania and would like to extend my sincerest thanks to the Australian Power Institute, Professor Michael Negnevistky and Susie Haley from the University of Tasmania and Dr. Marian Piekutowski and all the staff at Business Development Hydro Tasmania for this wonderful opportunity.