

The Inverse Times

Tesla Consultants

Specialist Consultants to the Electric Power Industry



April 2018

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From our Managing Director

It's hard to believe we are nearly a third of the way through another year.

will add another hub of engineering excellence available for our clients. We are currently recruiting experienced engineers for this new team – more information on page 2 of this Inverse Times.

We have had a particularly busy start to the year with a number of projects commencing immediately after the summer break. In February we held our bi-annual "Tesla Family Weekend" at Waihi Beach. We were grateful for the fine weather and warm waters, making it a fun time for everyone.

This additional office and organisational growth is extremely exciting. We firmly believe that it will enable us to provide even better service to our clients. We will send out further information as we move closer to confirming details.

Our family is growing rapidly and it is wonderful to see another generation of children among us, with such a wide range of family ages enjoying time together. We all certainly look forward to our next getaway in 2020!

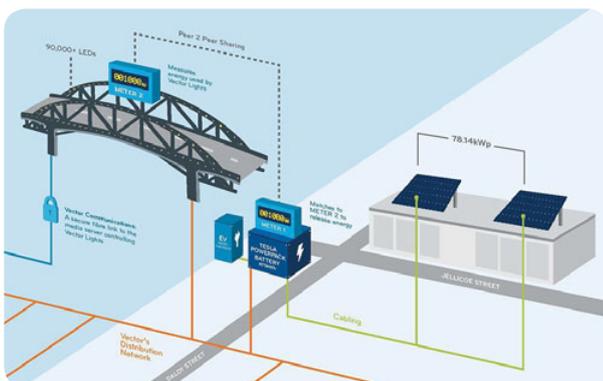
Our Christchurch office is growing also. We were pleased to have Bevan Cooper join our South Island team early this year. Bevan is an experienced engineer who brings a great set of skills to our Substation design team.

The exciting news this month is Tesla's new office in Auckland. This is in the planning stage now, and targeted to be open later this year. Tesla Auckland

If you see anything in this newsletter you would like to discuss further, please drop me an email, call; or contact any of our staff directly.

Alan Wallace

Vector Lights



Vector, in partnership with Auckland Council and in collaboration with the NZ Transport Agency are lighting Auckland Harbour Bridge with smart energy technology.

peer technology to deliver stored energy to the bridge.

On Saturday 27th January (Auckland Anniversary Weekend) the Auckland Harbour Bridge was transformed by the launch of Vector Lights. Lighting the bridge integrates the latest solar, battery and peer-to-

Tesla Consultants assisted Vector with protection settings and miscellaneous advice for their Lumens Battery and Solar 400V project. The project includes connection of the site to Vector's 22 kV network via a 1 MVA transformer.

For more information go to <https://www.vector.co.nz/articles>

Recruitment Underway for new Auckland Office



As a key element of our strategy to further enhance our position as the top provider of specialist engineering services to the New Zealand Electrical Industry, Tesla is opening an office in Auckland this year. We have commenced a programme to recruit top quality staff. Our aim is to achieve an office of 5-6 specialist staff, as soon as possible.

As New Zealand's largest city, Auckland is an important addition to our office locations; allowing us to expand our current service to clients within this key location and its surrounds.

We are looking to build a cross-discipline team that includes protection, sub-stations and communications/control systems specialists, with a view to future expansion that would include draughting support services.

Our wide-spread use of modern desk to desk interworking

technology, plus the ease of travel to our largest office in Hamilton means the new members will be closely integrated with our expert staff for coaching and other work sharing.

The final decision on the location of the new office, will be made after key recruiting is completed.

We will be keeping all clients and industry partners updated as the deployment progresses (watch our web site at www.tesla.co.nz for information) but if you have any questions, please contact alan.wallace@tesla.co.nz

EEA Conference 2018

"Lasting the Distance When the Lights Go Out" will be presented by Bevan Cooper and Matt Hall at this year's Conference. A modern-day switchboard replacement is a study in evolving technologies. Electromechanical relays are replaced with more accurate and versatile electronic relays; copper-based secondary cabling is replaced with much faster and more efficient fibre; and the switchgear itself is safer, cheaper to maintain, and more environmentally friendly than ever before. But the same cannot be said of backup power supplies. Although modern valve-regulated lead acid (VRLA) batteries are safer and cheaper to maintain than the original flooded lead acid batteries, the fundamental technology behind backup power supplies has not changed in the entire history of New Zealand's power network.

However recent advances in emerging technologies could be a catalyst for change. An increased focus on electric vehicles and home battery systems has accelerated developments in alternative battery chemistries; increasing adoption of solar schemes has contributed to price reductions for solar panels; and fuel cells are starting to bridge the gap between early adoption and mainstream acceptance.

In the modern operating environment, it is important for electricity industry participants to ensure that the carryover period of their backup power supplies reaches an appropriate level. Where the carryover period falls short, it can prove difficult to make up the difference. Space constraints are often a limiting factor, with reliability, safety, environmental, and maintainability issues also constraining the solution. This paper investigates the extent to which emerging technologies and other approaches can be used to assist industry participants in meeting their carryover targets.



Summer Intern – William Guest



It was a pleasure and a privilege to work at Tesla over the 2017/2018 summer. Being my first placement, I was keen to gain an insight into how my electrical engineering degree transferred into the real world, and to learn about the operation and future challenges of the New Zealand power system. Being able to spend time across the Communications, Substations/Power

Stations, Protection and Draughting teams helped answer some these questions.

I enjoyed participating in a wide range of projects. The theory I learnt was interesting and challenged me to build knowledge off the basics I had learnt while at university. Having the whole team at Tesla willing to guide my understanding was something I was very grateful for.

A site visit to the Huntly switchyard helped to contextualise theory. It was fascinating to see the physical implementation of the circuit diagrams I had been running my eyes over in the weeks leading up to the site visit. I would like to give a special thanks to Dennis Parker for imparting his knowledge during the site visit.

I thoroughly enjoyed my summer placement at Tesla. I look forward to seeing what area of this industry I end up in and I know my time at Tesla was the first stepping stone in this journey.



RECENT PROJECTS

Land Mobile Radio Trial



Land Mobile Radio (LMR) services at Waikaremoana used ageing equipment, and technology change had reduced its effectiveness. A trial using digital trunked radio services was proposed, and Tesla provided engineering services to ensure the trial installation by the equipment vendor interfaced well with existing site services and met the needs of the local operating and maintenance functions. Tesla then assisted with a formal evaluation of the performance of the trial.

The new Land Mobile Radio system uses modern Digital Mobile Radio (DMR) Tier III equipment and includes two multi-channel base repeaters with IP based inter-site linking, telephone and mobile phone interconnect and a computer-based GPS location display console for the main control room.

Tesla has a team of five engineers specialising in Telecommunications, and has very recent experience with defining user requirements and specifying DMR implementations targeting the special needs of in the Electrical Industry. Projects have included a wide area system for a major Distribution Company, a multi-site Hydro Generation campus, and specialist Geothermal Generation sites, so are well placed to assist with this work.

For more information contact Reece Peters at reece.peters@tesla.co.nz

Albany ODID Conversion Protection Settings



This engagement, for a large Distribution company was probably the largest ODID conversion protection study carried out in New Zealand.

A new 13 feeder Indoor Switchboard was commissioned at one of our client's major GXPs. The protection works for the Distribution company included a wide area protection review, then a review of the Transpower-Distribution company

co-ordination, six Grid Tie Studies, and preparation of setting files for 13 new relays at the GXP and the processing of settings changes for within the 33-kV network. Tesla's in-depth knowledge of the technical aspects of a tightly meshed 33kV sub-transmission network and our detailed experience with the Transmission side of these GXPs made for our specialist protection studies team ideal for this project. Tesla also has a high degree of experience in the close liaison required between the Grid owner and the Distribution Network owner for projects of this nature, which further assisted our client towards a successful outcome.

For further information contact David Harris at david.harris@tesla.co.nz

Comprehensive Dam Safety Review (CDSR)

Owners of large dams operate site-specific Dam Safety Assurance Programmes. Part of these programmes include an independent review of the dams on a regular basis.

Tesla regularly provides specialist engineering review services for these reviews covering electrical, communications, control and instrumentation aspects. The exceptionally wide and lengthy experience of our generation team, working in all aspects of Hydro Power Stations makes them very suitable for this review work. This programme of work includes a review of the



previous CDSR, preparation of test and inspection plans, inspection and witnessing of system tests, a review of asset maintenance and operation maintenance procedures, as well as the provision of technical input for the CDSR report.

For more information contact Chris Schinkel at chris.schinkel@tesla.co.nz

GXP Fault Level Sensitivity Investigation

The primary objective of this engagement was to provide a complete fault level sensitivity investigation for a Distribution company who operates HV circuits, following a significant snow storm event. Tesla's engagement included network modelling and assessing likely fault levels resulting from various emergency operating scenarios (for example having combinations of different lines and/or transformers in or out, and at different

levels of generation from a Generator connected at the GXP and other smaller imbedded sources). The impact of likely fault levels for each scenario was assessed. For each part of the network these impacts could range from no effect, decrease in discrimination margin or loss of discrimination, through to inability to satisfactorily provide protection for the various components of the network.

The outcome was a report and

collaborative discussion with our Client on all these specific implications to see which they consider acceptable and which are not, for each part of the network. Some aspects could be mitigated with measures that made them acceptable, thus allowing as much of the network as possible to remain connected in the various scenarios.

For more information contact Timothy Crawley at tim.crawley@tesla.co.nz

Eastern Ruapehu Lahar Alarm and Warning System (ERLAWS)

Installed following volcanic eruptions in 1995-1996, the Eastern Ruapehu Lahar Alarm and Warning System, or ERLAWS, is a lahar warning system on Mount Ruapehu. Supported by both the Department of Conservation and Genesis Energy ERLAWS sensors are located at various sites, Crater Lake outlet, NZ Alpine Club hut, near the Tukino ski field, Mangatoetoenui, Wahianoa the Tukino repeater and the mouth of the upper Waikato stream.

Signals from these sites are transmitted to the Genesis Energy power station at Tokaanu, where computers monitor the data received and upload it to an external server and the ERLAWS website.



When incoming data meet or exceed pre-set thresholds, alarms are sent via pagers to police, district council staff, Transit New Zealand, KiwiRail Network and DOC duty scientists who will then respond following predetermined plans. This alert can be up to two hours before a lahar would reach Tangiwai.

Activated at 10.47am on the 18 March 2007, the system successfully detected and warned about a lahar caused by a collapse of the tephra dam, causing a "medium" sized lahar which flowed down the mountain and into the Whangaehu River. Scientists estimated that 1.29 million cubic metres (1.29 billion litres) of sulphur and water flowed to the Whangaehu Valley. This lahar was at least



50% larger than the 1953 lahar that caused the Tangiwai disaster (source Wikipedia).

Following the 2007 lahar, reassessment resulted in the ERLAWS system being broadened in response to a wider threat.

Tesla Consultants has been involved with the ERLAWS project since 2009, providing engineering support services to ensure the maintenance of a stable and reliable system. Work completed by Tesla Consultants has included replacing voice modem with an SMS messaging system, upgrade planning and solution investigation, hardware supply, system documentation, software update installation, database migration, onsite system installation and system testing (offsite & onsite), fault resolution and support as required, as well as completing a general system upgrade in 2015.

For more information contact mark.mullins@tesla.co.nz

The Night of the Notables



Sean Mullins, the son of a Tesla employee participated in "The Night of the Notables", a co-curricular activity run by Hamilton Boys High School for year 9 advanced learning programme students.

Students were asked to choose a subject they are passionate about and find a notable person in this subject. Sean says he chose Nikola Tesla because "I was curious why my dad's work (Tesla Consultants) had decided to call their company after this person and why he had been special".

"We had to research this person and decide how to present this research. I used a display board like many others, but there were other ways like pamphlets and mini-posters. We were tasked with thinking of a way to make our display eye catching (or ear catching in some cases). To do this my dad and I built an interactive electronic device which demonstrated alternating current. Other students played the music of their notable person, made mini films or dressed up; which most people did, myself included".

On the evening of the event each student was given a table to display their work, with 6 students per classroom; spread over 7 classrooms. Each student talked to groups of people as they circulated classrooms to visit each display.

Great work Sean. Congratulations on a great display. You certainly looked the part!



Family Weekend 2018

Tesla's 2018 family weekend was held at the Waihi Top 10 Holiday Resort on Friday 16th to Sunday 18th February



2018. Altogether 41 adults and 22 children arrived at the holiday resort coming from our Hamilton, Wellington and Christchurch offices. Originally a camp for gold miners working in the Karangahake Gorge in the late 1890's it is one



of New Zealand's oldest holiday parks. With a great common area, a swimming pool, hot spa and sauna along with hang out areas and play grounds to suit different children's ages it proved to be an ideal venue for our family group. The eels in



the creek which runs through the holiday park were a highlight for our younger family members.

Plenty of time was put aside for activities, some choosing to surf and many taking advantage of the

warm water to swim. A great variety of cafes were visited, The Flat White Café is a must, located right on the beach.

Saturday night included dinner at the Waihi Beach Hotel followed by our Tesla Quiz show hosted by the Wallace family.

Waihi Beach is the perfect place to explore on foot. One group took advantage of this with a walk to Orokawa Bay. Spectacular views of the Pacific Ocean and Waihi beach made this a wonderful excursion. On arrival the group found

beautiful Pohutukawa trees sheltering a lovely beach, a perfect picnic location. Orokawa Bay is part of a designated scenic reserve which comprises 145 hectares of native bush, including kauri and nikau. The more energetic of the Tesla group carried on for another 50 minutes to the William Wright Falls.



Recognising Service

Recently presented with his 10 Year Distinguished Service was Rukshan de Silva. Congratulations Rukshan and thank you for your valued commitment to Tesla Consultants.



Allan Wallace presenting certificate to Rukshan de Silva

Introducing New Staff



Bevan Cooper

Joining Tesla in January 2018, after six years at the customer end of substation design, we are very pleased to have

Bevan on board. His skill set includes, Substation design, feasibility and options analysis, end-to-end project management, protection co-ordination studies, performance and fault analysis, electricity distribution regulatory environment including Asset Management Plans, SAIDI/SAIFI, IRIS, and Information Disclosure.

Board of Directors



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Tesla Consultants is an engineering consultancy providing specialist engineering and related services to the electric power industry.

