3rd AUSTRALASIAN
HYDRO POWER CONFERENCE 2011
Environmentally Sustainable Hydro Development

Program

Sunday 4 September 2011

4.30 pm to 6.00 pm	Registration	

Monday 5 September 2011

7.30 am to 9.00 am	Registration	
9.00 am to 9.15 am	Welcome and housekeeping	
Session 1: Strategic vision, project planning and risk management		
9.15 am to 9.55 am	Impact of new techologies on the electricity generating sector	Dr Keith Turner
9.55 am to 10.35 am	Managing project risk within an NEC3 contract — Meridian's experience	Marc Palmer, Tony Schinkel Meridian Energy
10.35 am to 11.05 am	Morning tea	
11.05 am to 11.45 am	The consenting process: improving the odds of a positive result	Peter Lilley TrustPower
11.45 am to 12.25 pm	Delivery of the Chacayes hydroelectric project	Tom Keddie Pacific Hydro
12.30 pm to 1.30 pm	Lunch	
Session 2: Civil and environmental engineering		
1.30 pm to 2.10 pm	Using instream habitat simulation to evaluate the effects of hydro power schemes: recent NZ experience	Dr Henry Hudson Environmental Management Associates
2.10 pm to 2.35 pm	Design, construction and commissioning of the Deep Stream hydroelectric scheme	Don Tate Riley Consultants
2.35 pm to 3.00 pm	Eco friendly technologies for hydro turbines	Masamichi Nakai, Kengo Izutsu Voith Fuji Hydro
3.00 pm to 3.30 pm	Afternoon tea	
3.30 pm to 4.10 pm	Small hydro, how to do it better and cheaper	Bryan Leyland
4.10 pm to 4.35 pm	Discussion paper on the assessment and adoption of environmental flows for small run-of-river hydropower schemes	Craig Bearsley Parsons Brinckerhoff
4.35 pm to 5.00 pm	The Mokihinui hydro project	Chris Evans Meridian Energy
5.45 pm sharp	Dinner — Walter Peak	

Tuesday 6 September 2011

Session 3: Asset management

9.00 am to 9.55 am	Hydropower lessons ... learned the hard way	Jo Grilli HydroPower
9.55 am to 10.35 am	Modelling the Teviot River Cascade System	Dougal McQueen Hyland McQueen
10.35 am to 11.05 am	Morning tea	
11.05 am to 11.35 am	Integrity assessment of headcovers and headcover fasteners	Annette Karstensen Quest Integrity
11.35 am to 12.05 pm	Rehabilitation of the Ambuklao and Binga hydroelectric power plants	Brendan Hayes McConnell Dowell
12.05 pm to 12.30 pm	Achieving ASME temper bead weld repair at Poatina Penstock	Robert Dillon Hydro Tasmania
12.30 pm to 1.30 pm	Lunch	

Session 4: Upgrading or constructing new assets

1.30 pm to 2.10 pm	The challenges of upgrading ageing control systems and the growing sophistication of control systems in hydro station applications	Simon Sam AECOM
2.10 pm to 2.35 pm	Lake Mangaonui Spillway Gates	Robert Shelton TrustPower
2.35 pm to 3.00 pm	The construction of the Paul Wilson hydro scheme	Jimmy Wilson
3.00 pm to 3.30 pm	Afternoon tea	
3.30 pm to 4.10 pm	100 MW to 120 MW, the Pantabangan Upgrade	Tony Mulholland, Ben McQueen Parsons Brinckerhoff
4.10 pm to 4.35 pm	The Wye Creek power station refurbishment	Peter McClean, Meridian Energy (seconded to Pioneer Generation)
4.35 pm to 5.00 pm	Best Practices in the management of hydroplant refurbishing and upgrading	Niels Nielsen Aurecon
6.10 pm onwards	Dinner — Kitchen and Winehouse	

Wednesday 7 September 2011

8.00 am to 10.00 am	Visit to Clyde Dam Tour: Group A
8.00 am to 10.00 am	Visit to Pioneer Generations hydro schemes: Tour Group B
10.30 am to 12.30 pm	Visit to Clyde Dam: Tour Group B
10.30 am to 12.30 pm	Visit to Pioneer Generations hydro schemes: Tour Group A

Conference website www.hydroconference.co.nz

Papers and Speakers

Managing Project Risk within an NEC3 Contract

Presented by Tony Schinkel and Marc Palmer, Meridian Energy

Improving and sustaining the productivity of hydro generation assets is a challenging and often unpredictable undertaking. Successfully managing the risks that these projects create requires a sophisticated risk management framework. Meridian uses the NEC3 contract suite extensively and it is an integral part of our approach to the management of risk.

The recently completed Benmore Refurbishment Programme was a series of related projects executed using a series of NEC3 contracts. It was successfully delivered 10% below budget, with an award winning safety record and to a level of quality which will ensure improved performance for the station for the next 40 years.

The presentation will outline some of the significant risks faced and the part that the use of the NEC3 contracts played in mitigating them.

The consenting process: improving the odds of a postive result

Presented by Peter Lilley, Trustpower

Hydro-electric power schemes arguably represent the most complex infrastructural projects for which to gain resource consent. Their interaction with the natural environment, use of water, land & earth and their impact on communities and society requires a multifaceted approach to steering a project through the labyrinth that is the Resource Management Act (RMA).

The RMA has been in force now for 20 years. In that time few new hydro-electric schemes have gained resource consent, and those that have are either small or have been forced to endure a protracted process.

While it may be easy to lay blame for the lack of hydro-electric schemes being advanced on the RMA it is not that simple. If it can be argued that the RMA accurately represents societal expectations for resource management in New Zealand, then irrespective of how legislation is drafted, it could be anticipated that a similar process would still occur. Rather the challenge to developers of schemes is to recognise the wider environment in which they are working and adapt methodologies and behaviours accordingly.

The following paper discusses some lessons learned from past resource consent processes for hydro-electric schemes, challenges some historical perceptions, and advances some suggestions on how the process may be more rewarding.

Delivery of the Chacayes Hydroelectric Project

Presented by Tom Keddie, Pacific Hydro

Pacific Hydro, a leading Australian renewable energy company, is developing a series of cascading run-of–river hydro electricity projects in the Cachapoal Valley, in the foothills of the Andes Mountains some 100 km south of Santiago in Chile. Pacific Hydro acquired a package of water rights in the Cachapoal Valley in 2004 as part of the acquisition of the 76 MW Coya and Pangal hydro plants from Codelco, the Chilean state-owned copper producer.

The first greenfield project in this cascade, the 111 MW Chacayes project, is located immediately upstream of the existing Coya project. Chacayes reached financial close and commenced major construction on 20 May 2009, at the height of the Global Financial Crisis. On the construction side, the project involved an EPC contract for the majority of project works with a consortium of Astaldi SpA of Italy and Fe Grande of Chile as contractor, and a separate EPC contract for construction of an HV transmission line with Abengoa. Astaldi SpA also took a 27.3% equity stake in the project. The commercial arrangement for the project included a US$200m limited recourse project financing with a consortium of five international lenders, and a long-term offtake contract with Chilectra, a major Chilean utility. Construction of the project is approximately [80%] complete at the date of writing and scheduled for first generation in 4Q2011.

This paper will outline the development, financing and delivery of the project, against the backdrop of a construction contracting market stretched by mining demand fuelled by the ongoing commodities boom and financial markets bruised by the GFC and related liquidity issues.

Notable features of the project to be covered include:

- The inclusion of EPC contractor as an equity partner and associated challenges in documentation, incentives and construction management

- The risk-sharing mechanism for underground works in the EPC contract between the owner and contractor
- The inclusion of a non-standard dispute resolution procedure for the EPC contract, incorporating a Dispute Review Board
- Securing project debt and equity finance in difficult global markets
- Negotiating the power purchase agreement inclusive of project finance requirements
- The project in the context of Pacific Hydro's broader development plan for the Cachapoal Valley

The development of project-financed, independent power producer (IPP) generation facilities is complex enough in any case, but the added complications of the EPC contractor as a shareholder and the scarcity of funds during the GFC make the development, financial close and subsequent construction progress on Chacayes an outstanding achievement.

Using instream habitat simulation of evaluate effects of hydro power schemes: recent experience

Presented by Dr Henry Hudson, Environmental Management Associates

A shopping list of potential adverse effects must be evaluated when considering altering river flows for hydro power. Hydraulic habitat analysis is a widely used tool to evaluate the proposition that avifauna, fish and other aquatic organisms are best adapted to natural flows. Based on recent New Zealand experience, it is shown that some perceived adverse effects are not substantiated; that natural or modified flow regimes are a compromise between competing aquatic habitat uses; and that flow regimes can be managed to minimise adverse effects, or improve habitat for target species.

Design Construction and Commissioning of the Deep Stream Hydro Electric Scheme

Presented by Don Tate, Riley Consultants

The Deep Stream Hydro Electric Scheme is a cascade arrangement that utilises a 310 m head difference between an existing diversion weir and Lake Mahinerangi. TrustPower was successful in obtaining consent for the scheme and the adverse environmental effects were considered minor. The scheme is located in a remote area of tussock vegetation and highly modified pasture with gently undulating terrain.

The major water retaining structures are a 25 m high earth dam impounding 1.9 million cubic metres and a 10 m high saddle dam. This reservoir feeds 7 km of canals, and two powerhouses generating a total of 6 MW. The reservoir is located on Dunedin City land with a long term lease arrangement and, as part of the agreement, provides drought water storage for the city. Other notable scheme features include the use of fibreglass re-enforced penstocks and turbines, designed and constructed in New Zealand. The site geology comprises schist rock. Schist is not an ideal dam building material and sound engineering was required to obtain a cost-effective design for the dams and canals.

This paper outlines the key features of the scheme with particular reference to risk-based decisions which were made during design and construction, and describes how various challenges encountered in the commissioning phase were successfully overcome.

Eco Friendly Technology of Hydro Turbines

Presented by Masamichi Nakai, Kengo Izutsu, Voith Fuji Hydro KK

The 21st century is the environmental era, when developers of energy production projects have to pay attention to the impact of their projects on the environment. To achieve this goal in the hydro community, Eco friendly technologies are required. This paper presents the latest Eco-friendly technologies applied to the hydro power generation field, with a particular focus on three aspects — Water conservation, Life conservation, and Land conservation.

As one of the recent technology developments, we will introduce `Water Lubricated Guide Bearings`. This allows us to eliminate the whole `Lubricating Oil System` and `Cooling Water System` - and eventually enables us to do away with the use of lubricating oil and of taking water for cooling. The other ways of reducing or eliminating oil are the 'oil-less Kaplan Turbine Hubs' and the 'Hybrid Servo Motor'.

As an another one, we also introduce the 'Air Cooled Generator'. This has always been used on small machines but has now been extended to the larger sizes of small hydro projects in Japan. This type of generator eliminates the Generator Cooling Water System. This just not only eliminates leaks leading to contaminated water escaping to the river but also reduces capital and maintenance costs.

This has been considered one of the more critical issues for the impact of hydro on the environment, but there are now designs to lower the 'fish mortality rate' in the operation of hydroelectric power generation. In the paper, we focus on how the design of turbine components has been modified to be more fish-friendly. We will introduce it together with our history and experience with these designs.

Construction of infrastructure facilities like power plants always requires a fairly large land space. To reduce the amount of land required, and particularly for retrofit situations where there is often very limited space available for the new machine, we have developed and installed in Japan the 'Vertical Bulb Turbine and Generator'. The other aspect of land conservation is to utilise wherever possible all accessible hydro resources. New Zealand is about to embark on the development of several irrigation projects. Some of these will include drop structures which can be developed for hydro generation by utilising the simple standardised packaged 'Micro Turbines'. These packaged units can also be used to generate from the compensation flow from dams and weirs.

Small hydro schemes: how to make them cheaper and better

Presented by Bryan Leyland

This paper draws on the information I have collected for a book that I'm writing on small hydropower. It covers all the main features of small hydro schemes and explains what is important, mistakes to avoid, options for achieving the best results etc.

It includes intakes, including the recently developed Coanda intake, settling basins, canals, penstocks, turbines, generators, powerhouses and auxiliary systems.

It sums up everything I have learned–and a few of the mistakes I and others have made–over the last 40 years in the hydropower business.

Hydropower lessons ... Learnt the hard way

Presented by Giuseppe (Jo) Grilli, HydroPower

The electricity generation achieved through the conversion of the hydraulic energy is nowadays considered a mature and safe technology, reasonably good for the environment and the society.

Yet the tremendous amount of energy, in hydraulic, mechanical or electric form, that can be uncontrollably released at hydropower plants, has devasting impacts which at times tarnished the otherwise good image and reputation of hydropower technology.

In spite of the ever increasing standard of safety aimed at in the design, construction and operation of hydropower plant incidents still occur in the hydropower industry after more than a century of technological development. The Sayano Shushenskaya incident in August 2009 is the most recent reminder of how destructive the hydraulic energy can be if it gets out control.

With over half a century of hands-on experience as a professional in the hydropower industry, the author has directly, or indirectly learnt about a number of 'things gone terribly wrong' at hydropower plants and, over the years, has gathered the relevant information.

In this paper the author firstly illustrates the manifestations of the various incidents he has knowledge of, summaries their effects and causes in a systematic classification and concludes with some aphorisms on learning from experience.

Modelling the Teviot River Cascade System

Presented by Dougal McQueen, Hyland McQueen

The Teviot River is located in Central Otago and has been used for electricity generation since 1896. Lake Onslow sits at the head of the river some 600 m above the Clutha River into which the Teviot discharges. Today the scheme comprises a series of four reservoirs, six power houses, canals and tunnels capable of delivering 16.5 MW. Further the system also provides water to three irrigation systems. There are also many operational and resource consent conditions that pose constraints of the system. This paper describes efforts to optimise the operational management of the system to maximise expected revenue.

A hydraulic model of the system has been built by developing component models for reservoirs, river sections and generators, and combining these into a time stepping simulation. Data from the model are compared with the actual operation of the system and then the model is used to search for an operating paradigm to maximise revenue under different operational scenarios. Lake Onslow has sufficient storage to allow annual management of the system, hence there is conflict between providing sufficient water to meet irrigation demands during the summer and holding back the release of water to all maximum revenue to be generated when prices are typically higher during winter.

The importance of Integrity Assessment of Headcovers and Headcover Fasteners

Presented by Annette Karstensen, Quest Integrity

With the headcover failure in the Russian Sayano-Shushenskaya hydropower plant, the integrity of headcovers and headcover fasteners have become of particular interest to plant owners across the world.

Fatigue initiation in fasteners can lead to failures as seen in the Sayano-Shushenskaya incident. The issues that lead to fatigue cracking and how to avoid it will be covered in this paper. Discussions will be on how this failure could have been avoided by employing good bolting practice and the effect of uneven pretension in the bolts. Issues surrounding the material performance and material degradation such as hydrogen embrittlement and stress corrosion cracking of bolting material are also covered.

The concerns and the lesson learned from the Sayano-Shushenskaya incident has resulted in a series of assessment of headcovers and fasteners from various power stations operated by Hydro Tasmania.

The assessment includes headcovers from three different power stations; some of which previously exhibited cracking. A finite element analysis was employed to determine the through thickness stress distribution which was used in the fitness-for-service analysisInitial analysis of one of the headcovers determined that a vibration assessment should be conducted. This assessment included vibration measurements taken from the headcover during start-up and steady state operation. The results of the measurements were incorporated into the stress analysis and a subsequent fatigue analysis was carried out on the critical regions of the headcover identified in the analysis.

The results of the analysis provided Hydro Tasmania with quantitative evidence with respect to areas within the headcovers that should be targeted for inspection and maintenance strategies.

Rehabilitation of Ambuklao and Binga Hydro Electric Power Plants

Presented by Brendan Hayes, McConnell Dowell

The Ambuklao Scope of Work, includes construction of a New Intake Structure with extensive earthworks and shotcrete/rock bolt slope stabilisation work, 150 m deep Drop Shaft, construction of a Tunnel from existing underground Power House access decline, to above the existing Head Race Tunnel, the sealing of the existing Headrace feed to the Power House, and the construction of new Steel Bifurcation works. The Construction of a second tunnel to link the new Intake and Drop Shaft to the newly constructed Bifurcations leading to the Power House and Turbines. Other activities include the placement of some 30,000 cu. metres of Rip Rap slope protection to the upstream face of the Dam, rehabilitation of the 2 km long Tail race Tunnel including the removal of 20,000 cu. metres of silt and construction of new water proof Ceiling to the Power House.

The Binga Scope of Work comprises of the construction of a New intake Structure, Drop Shaft and Tunnel connection to existing Head Race Tunnel and extensive grouting works to the underside of the Concrete Spillway.

The tight Construction Schedule with numerous critical deadlines is linked to the wet season access to various site locations and to interface with the Electro-Mechanical Contractor.

Achieving ASME Temper Bead Weld Repair at Poatina Penstock

Presented by Robert Dillion, Hydro Tasmania

Poatina penstock suffered a self exciting penstock resonance event in 2007. One of the original welded pressure tapping points suffered a through thickness crack and a number of other welds were also found defective. Following review of several repair options, all pressure tapping points were removed and circular patches installed using an ASME qualified temper bead welding process. This technique was chosen to best manage the risk of cracking both during welding and during future plant operation. Detailed thermal and mechanical stress calculations, residual stress analysis and fracture mechanics studies were performed in conjunction with extensive weld qualification tests and non destructive examinations to ensure the success of the weld repairs. Hydro Tasmania will apply the practices utilised during this work to improve future plant inspection, assessment and repair.

100 to 120 MW, The Pantabangan Upgrade

Presented by Tony Mulholland, Ben McQueen, Parsons Brinckerhoff

The Pantabangan hydro electric power plant is located on a nationally significant rice irrigation scheme in the Philippines. It is designed as a peaking station with black start capability and was constructed in the 1970s. The plant was in need of a modernisation and upgrade when it was privatised and purchased by First Gen Hydro Power in 2006. The project involved a complete station refit with the majority of the equipment supplied by Andritz Hydro.

The project achieved some outstanding outcomes including, an outage time of six months per unit, on time completion of both units and high reliability post overhaul. The station maximum power output has increased 20 percent, and efficiency is also significantly improved.

Parsons Brinckerhoff as owner's engineer managed the project from tender specification through site supervision to now providing warranty support. This paper will give an overview of the project, the lessons learnt and some of the interesting challenges along the way, both cultural and technical.

The Challenges of Upgrading Ageing Control Systems and the Growing Sophistication of Control Systems in Hydro Station Applications

Presented by Simon Sam, Co-authors: Scott Thode and Dennis Preston, AECOM

This paper outlines the lessons learned from the Author's recent involvement with the upgrade of control systems associated with several hydropower stations in New Zealand. We discuss the challenges that can be faced when upgrading hydro control systems and offer suggestions on ways to manage them. We also explore the growing sophistication of control systems in hydropower stations and their possible future applications.

The challenges

During the different phases of a control system upgrade, whether it be a small upgrade to a single sub system of a station; such as the upgrade of an excitation system, or a large upgrade; such as the upgrade of plant wide control systems over several stations, the challenges remain the same.

The challenges that may be encountered include:

- A range of different technologies used in previous upgrades, for example timer and relay control circuits are often found intertwined with the PLCs installed during the A/RC upgrade works in the mid 1990s.
- Out dated documentation relating to the existing control systems
- The 'black box' stigma of modern control systems. It is not always clear how the control system operates.
- Fully grasping what the upgrade involves, and the full capabilities of the new control system.
- Continuous design change/request process as the project proceeds through into the implementation phase.

How to manage the challenges

The key to ensuring that the control system upgrade can be effectively managed during the course of the project lies in the preparation prior to commencing the project. This includes:

- Obtaining a thorough understanding of the capabilities and features of the new control system, and ensuring suitable staff resources are identified who have the capability to roll out the upgrades.
- Where the upgrade affects multiple sites, a standard design template should be developed upfront that can be adapted to all sites.
- Where practical, the initial site of a multiple control system upgrade should be treated as a trial site.
- Recording full documentation of the upgrade works throughout the project.

Growing Sophistication

Hydro station control systems have evolved over time to keep pace with technological advancements. Timer and relay control circuits were swapped to solid state devices, which were then replaced with unit PLCs. These unit PLCs are now being integrated into station wide (and even country wide) SCADA systems that allow for the real time control and monitoring of all the assets from a remote centralised location.

Asset owners now have the opportunity to have all of their assets fully integrated together for real time control. While this raises concerns regarding network security and software updates which will ultimately need to be addressed, it offers significant advantages which facilitate load sharing between hydro stations and wind farms to allow for the more effective management of water use during dry years, and allows for real time variation in the generation output from wind farms to meet contracted market power supply commitments.

Key design, fabrication and installation aspects of the Lake Mangaonui Spillway gates

Presented by Rob Shelton, TrustPower

TrustPower's Lake Mangaonui Spillway, in the Bay of Plenty Kaimai schemes, was raised in 1986 with a 16 m long, 1.8 m high 'rubber dam'.

When the rubber dam reached the end of its 25 year design life a decision had to be made on what structure should replace it, and how this could be best managed.

A brainstorming session, looking at benefits, risks and cost, decided that 4 No. bottom hinged steel gates were the preferred solution as they could be configured to maximise revenue (by trim spilling) and meet the dam safety requirements for spillway gates. These meet the NZSOLD guidelines for appurtenant structures with respect to power supply, hydraulic operation and controls.

The key design, fabrication and installation aspects of the replacement spillway gates are described in this paper.

Wye Creek Power Station Refurbishment Project (1.7 MW)

Presented by Peter McClean, Meridian Energy Ltd – Seconded to Pioneer Generation Ltd

Wye Creek Power Station, originally built by the Golden Terrace Extended Gold Dredging Company Ltd, dates back to the early 1920s. The station is situated approximately 15 km out of Queenstown. With 315 m of head it gets water from both the north and south branches of Wye Creek on the Remarkables Mountain Range.

At the time of purchase by the Otago Central Electric Power Board in 1941, Wye Creek Power Station had a generation capacity of 400 kW from its single Pelton unit. An additional turbine and generator, formally from the Lower Roaring Meg Scheme, was installed in 1991 and increased the capacity of the station by 1000 kW. At this time major upgrading and renewal of the penstock and foundations and exterior cladding of the power house was completed.

The original machine was decommissioned in December 2008 due to an unforseen failure, which brought forward the commencement of the station refurbishment project. The refurbishment consists of a full replacement of the existing turbine and generator, installation of new control and protection systems, and replacement of the generation step up transformer. The unit to be installed is a 1.7 MW twin-jet horizontal Pelton wheel.

Over the last 11 years, the present owner, Pioneer Generation Ltd (Pioneer), has completed five major station refurbishments as well as commissioning two new hydro power stations. Their systems and philosophies, around small hydro scheme design and control are well defined and proven. This paper will give an introduction to Wye Creek Power Station, as well as an overview of the refurbishment project. It will discuss in detail the control and protection systems used, while emphasising Pioneer's design and control philosophies.

Assessment and adoption of environmental flows for small run-of-river hydropower schemes

Presented by Craig Bearsley, Parsons Brinckerhoff

There are considerable social and environmental benefits in generating energy by using small run-of-river hydropower schemes. This paper highlights some of the important considerations that designers and developers should consider when selecting an appropriate method for estimating environmental flow.

Best Practices in the Management of Hydroplant Refurbishment and Upgrading

Presented by Niels Nielson, Aurecon

Based on personal experience, in addition to a general overview of rehabilitation and upgrade processes, this paper discusses examples of best practice and opportunities for improvement.

Mokihinui Hydro Project, Buller, New Zealand

Presented by Chris Evans, Meridian Energy

In this update on the $350 million Mokihinui hydro project the presentation covers project selection, details of the proposed scheme and the regulatory approval process to date.

Paul Wilson Hydro Scheme

Presented by Jimmy Wilson

Construction and problems will be discussed from a first time building perspective of the Beaumont small hydro scheme, with special attention to issues regarding landowner negotiation, public misconceptions regarding rights and technical issues such as placing penstock in loess soils, and having an open channel race in 4.5 km of very steep hill country running through schist and silts.

Evening Functions

Monday Night Dinner – Walter Peak Station

Enjoy a nostalgic cruise on the TSS Earnslaw to the Colonel's Homestead at Walter Peak where you will enjoy high country hospitality and a carvery style buffet, featuring the best of New Zealand meats and seafood, along with fresh vegetables and garden salads. You may well find the house dessert specialities hard to resist!

An entertaining after dinner show provides a glimpse into farming life. On your return cruise to Queenstown, relax with a drink from the bar or join a lively sing-along.

Tuesday Night – Kitchen & Winehouse

The Winehouse & Kitchen is a gorgeous farmhouse style restaurant situated in an amazing 100 year old restored villa nestled amongst immaculate gardens and overlooking the Bridal Vail waterfall.

Located just 20 minutes from Queenstown, adjacent to the Kawarau Bungy Centre it is also home to award winning wines van Asch, Hawkshead & Rockferry Wines.

Optional Hydro Station Tour

Contact Energy and Pioneer Generation have generously given conference participants the opportunity to visit the Clyde and Wye creek power stations. The tour will leave at 8 am and return at 1 pm.

Clyde

The Clyde Dam on Lake Dunstan is the largest concrete gravity dam in New Zealand. There is a million cubic metres of concrete in the dam with another 200,000 cubic metres in the powerhouse. The power station is capable of producing 432 megawatts (MW) of power from its four turbine generator units.

A great deal of landslide stabilisation work was carried out behind the dam before Lake Dunstan could be filled and the power station commissioned. More than 14 km of tunnels were excavated into the hillsides to prevent water build-up that could destabilise the hillsides. Huge buttresses of compacted rock and gravel have been built to strengthen the hillsides and a total of 3,500 measuring and monitoring instruments have been installed around the lakeshore.

Wye Creek

The Wye Creek power station is to be refurbished, work commenced December 2010.

The existing generating equipment will be removed and replaced with a new larger turbine and generator. The control and protection systems at the station will also be replaced.

The new turbine and generator will have a maximum output of 1.7 MW and the station will have an estimated annual energy output of 12.5 GWh. This is about a 20% improvement over the existing station, the improvement coming about due to efficiencies in the design of the new turbine and generator. The new turbine and generator are being supplied by Gordon Gilkes Ltd, UK.