update

NIWA
Taihoro Nukurangi

Instrument Systems

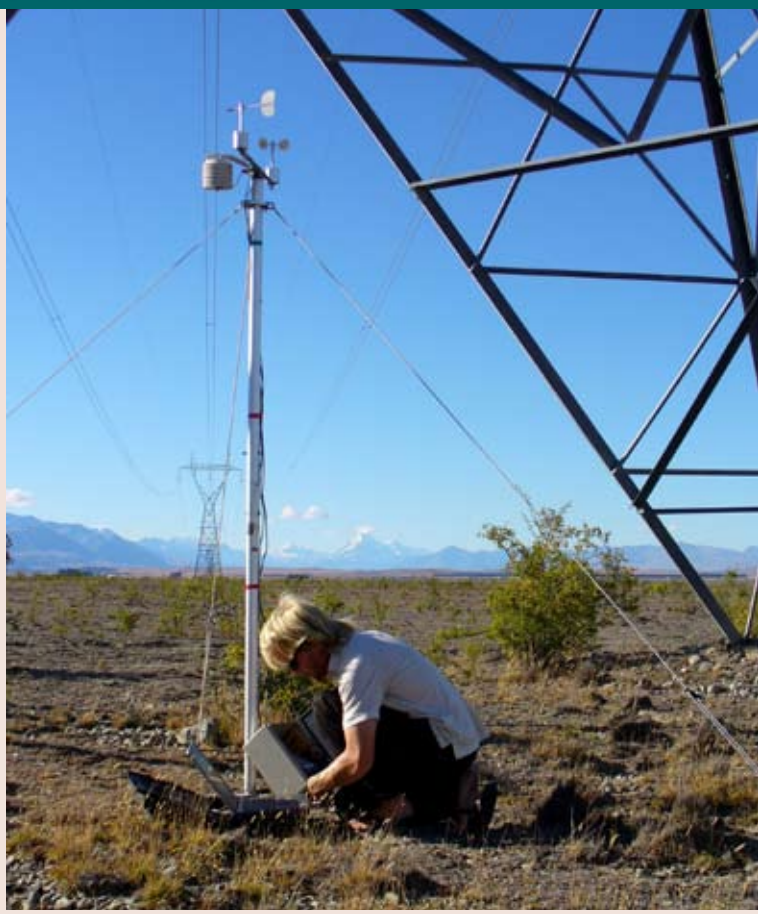
collecting data, delivering solutions

Power lines surveyed

NIWA staff recently covered thousands of kilometres in the backblocks helping to survey a number of power transmission lines which form part of the national grid.

The survey information will enable the grid owner/operator, Transpower, to better understand and manage the effects of temperature on existing transmission lines. Lines expand and sag as they get warmer. Their temperature depends on the heating effect of the electrical current flowing through the line and on prevailing weather conditions (sunlight contributes to heating; wind contributes to cooling).

Surveying was carried out using a helicopter-mounted laser ranging instrument (LIDAR), operated by a Russian company, Opten, working through their NZ agent, Power Systems Consultants. The LIDAR accurately locates the lines, and 'line sag' can be calculated under known conditions. NIWA's involvement was to provide, deploy, and redeploy more than twenty portable meteorological monitoring stations along the transmission line as it was being surveyed, recording wind, solar radiation, and air temperature. Between 100 and 200 km of line were covered most days. NIWA also used a small balloon-borne weather station to get a vertical profile of conditions around transmission line heights. In combination, these data enable a complex meteorological model to derive the line temperature and performance characteristics for each of several hundred spans each day.



Shane Rodwell downloads data from a portable meteorological monitoring station near Twizel during the power transmission line survey. Mt Cook is in the distance. [Photo: Steve Le Gal, NIWA]

Oxygen system reduces risk to fish

Water from a nearby stream is pumped into the large blue cone-shaped towers called diffusers (right) where oxygen is added if required. The oxygenated water is then piped into the raceway. [Photo: Mark Crump, NIWA]

NIWA's Silverstream hatchery, north of Christchurch, mainly rears Chinook salmon for supply to commercial fish farms. The hatchery gets its water from a nearby stream. During early morning in summer the water may not contain enough dissolved oxygen due to the respiration demand of aquatic plants in the stream. This can be fatal for the salmon.

Nelson Boustead and Mark Crump from NIWA Christchurch, in conjunction with 'Point Four', a Canadian company specialising in oxygen enhancement technology for fish farms, have developed a system to overcome the problem of oxygen deficiency.

Oxygen levels in the raceways are monitored with electronic dissolved oxygen sensors placed at the water entry and exit points. If the oxygen concentration falls below a pre-determined 'safe' level, then extra oxygen is automatically injected into the water supply. This system ensures that there is sufficient dissolved oxygen in the water at all times and under all conditions, and has significantly reduced the possibility of fish mortality.

Breakthrough in rainfall measurement

Accurate modelling and prediction of weather trends relies on the precise measurement of both rainfall intensity and rain volume. In the past, that's required two different instruments, the high resolution Rain Intensity Gauge (RIG) and the more common Tipping Bucket Rain Gauge (TBRG). Now Instrument Systems has designed a single instrument to do the whole job.

The RIG measures rapid changes in rainfall intensity by capturing and channelling rain, and forming the water into individual droplets which are then counted. In contrast, the TBRG measures total rainfall using a 'bucket' of defined volume which tips when full.

The Smart Rain Intensity Gauge (SRIG), designed by Instrument Systems, combines both approaches. A perspex funnel channels rain water to a drop former, a drop sensor, and an overflow sensor. An electronic circuit combines the drop count and the bucket tip data. SRIG supports an SDI12 data interface so that it can be connected to any standard data logger, and also accommodates an optional Unidata NRT (NEON Terminal) telemetered data logger. An internal battery allows the unit to operate for at least three months in a self-powered mode, and we can add a flexible solar panel if stand-alone performance is required.

The new SRIG, designed by NIWA Instrument Systems, provides simultaneous measurement of both total rainfall and rain intensity by one instrument – a major advance in rainfall measurement instrumentation. [Photo: Dave Gibb, NIWA]

Improved rain gauge calibration

Instrument Systems has further improved its method of calibrating and testing tipping bucket rain gauges, using modern technology and computing power.

The rain gauge calibrator is a combined software/hardware system which automates most aspects of the tipping bucket rain gauge calibration process. Currently up to four rain gauges may be calibrated at the same time. The software and electronics control the water pump, records bucket tips and measures the water delivered from each tip using precision electronic weighing scales. The gauges, by their very nature, still require manual adjustments. When the calibration is complete, a calibration certificate is automatically generated.

Dave Gibb runs our upgraded calibration system for tipping bucket rain gauges. The system measures overall accuracy and other aspects of gauge performance including variations in individual tip capacity, the rain rate at which the calibration was performed, and the reed switch closure period. [Photo: Jeremy Bulleid, NIWA]

Stand-alone RIGs now run on solar power

NIWA's Rain Intensity Gauge (RIG) is now fully stand-alone.

The new RIG is fully telemetered using Unidata NEON (Crossramp) technology using either the GPRS or CDMA cellular networks. This allows the hourly reporting of rainfall data with rain intensity data recorded every 6 seconds during rain events. A flexible solar panel on the housing provides power for the sensor and communications and charges the internal battery. As a result, the gauge no longer requires regular site visits for data collection and battery replacement. Five units are currently being commissioned for use within the NIWA Climate Network.

NIWA's upgraded Rain Intensity Gauge showing the new flexible 'wrap around' solar panel. [Photo: Mike Hodkin, NIWA]

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