Colonial Knob Winter Work Programme by John ZL4JY August 2017

It's been a busy few weeks at Colonial Knob despite the generally poor weather. This winter the backup power DC plant has been upgraded while new repeaters for Surf Life Saving New Zealand and the Wellington Region Emergency Management Office have been installed. This work, fortunately indoors, was completed by Ray ZL2RAY, Peter ZL3TC, Steve ZL2KG, Jeff ZL2JG, and John ZL4JY. All the materials used were supplied by SLNZ, WREMO, or donated to the VHF Group.

Power Upgrade

For many years the site has run using an old APC 2200 XL UPS that was donated by 4RF complete with eight Marathon TV 180Ah batteries configured for 48VDC. An additional four 12V 100Ah batteries, configured for 24V, were installed just over a year ago with another APC UPS unit to power the Cisco router and other IT equipment that supports the AREC DMR system. These newer batteries were supplied by AREC because the IP networking at Colonial Knob is the heart of the national AREC DMR system.

The original Marathon batteries were 10 years old when first installed and while originally providing about 8 hours endurance, they finally gave up the ghost earlier this year and had been removed and recycled.

The DC plant has now been completely reworked eliminating the APC UPS units. With eight reasonably new 12V 200Ah 6FM200 Vision batteries weighing in at 65 kg, each kindly donated by Spark, the site now has three banks of batteries, two 48VDC banks at 200Ah each and the year old 24 VDC system reconfigured as another 48V bank at 100Ah for a total of 500Ah. The batteries are shown below. Note that seismic bracing is still to be completed.

The batteries are charged by an Invensys Integry system with two R1248 24A 48V rectifiers combined with a control unit and low voltage disconnect donated by 4RF (lower unit). Mains power is provided by two new Unipower Telecom Scimitar INV4810RH-E 1kW inverters (upper 1RU units) provided by John ZL4JY.

Almost immediately after installation power cuts occurred over a wide area of Wellington putting the new installation under test. Without optimisation of the load the run time was almost 24 hours, approximately three times the endurance of the old system. Re-organizing loads will increase endurance further.

Surf Life Saving New Zealand goes DMR

SLSNZ is upgrading their communications networks around New Zealand to DMR, the same digital voice standard adopted by AREC and LandSAR. In the North Island, their operational DMR networks include the Bay of Plenty (from Hot Water Beach to Maketu) and for Wellington and the Kapiti Coast from Paekakariki to Himatangi. Later network expansion is expected in the South Island for beaches in Christchurch and Dunedin, and in the Northern Region, Taranaki, and Hawkes Bay. Like all volunteer organizations, expansion depends on funding. SLSNZ is one of the organizations that contributes to SAR operations and approached AREC Wellington to see if use could be made of Colonial Knob to cover the northern Wellington area. AREC in turn approached the VHF Group Committee and an agreement was reached that the site could be used provided the installation was done by the Group and the annual power use was reimbursed. The Group does not host money making businesses at the site but emergency networks such as SLSNZ are a good fit.

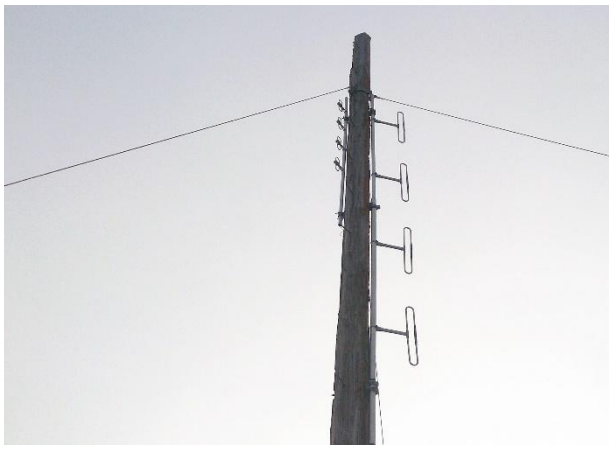
The SLSNZ equipment consists of two Italian made Radio Activity Kairos DMR base stations, one used as a repeater and other as a linking station. Unlike the AREC DMR network which uses IP linking via 5.8 GHz or the Internet, the SLSNZ VHF DMR network is interconnected via UHF point to point links. It is Group policy that all transmitters at the site must be fitted with transmit isolators to minimise IMD and SLNZ supplied isolators made by RFI Australia for both the VHF repeater and UHF link.

WREMO

The Wellington Region Emergency Management Office (WREMO) was formed in 2012. The organization co-ordinates Civil Defence and Emergency Management services on behalf of the nine councils in the Wellington region, replacing the previously individual CD efforts of local authorities. WREMO is in the process of updating its communications strategy and part of that initiative is a significant update of their VHF communications network. WREMO have decide to retain analog FM operation on the ESB band for the medium term because of the large amount of radio equipment already deployed in the region but rationalisation and improvement of repeaters sites is underway.

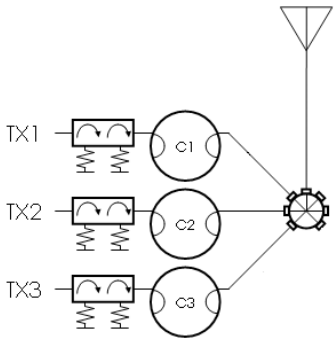
Seeking to improve coverage around the Porirua and Tawa areas WREMO approached the VHF Group for assistance. AREC in Wellington has a long history of supporting Civil Defence and the Group agreed to use of our site on the same conditions as SLSNZ (installation done by the Group and power use reimbursed). The WREMO repeater at CK is a Kenwood model. The Group specified 168mm / 6.625” cavity bandpass filters to be used for transmit and receive, with an isolator again for IMD reduction. These recommendations were accepted and RFI equipment supplied for use at the site by WREMO. The single stage RFI isolators provide 35 dB return isolation with just 0.35 dB insertion loss. The WREMO repeater has its own independent batteries, supply shown here being installed by Peter ZL3TC.

Antennas

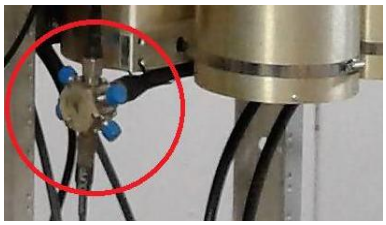


While Colonial Knob is a long-established radio site, it is also a site with strong visual and cultural interest. The Group strives to minimise visual pollution and is always working to improve the site's visual signature. All unnecessary external hardware (junk) has been removed from the site. Painting of the building is underway along with other improvements. To avoid adding antennas for these new repeaters and slowly turning the site into something resembling a porcupine, a process of multi-coupling is being used to share antennas between various repeaters.

With good engineering, this can be done in such a way that the services do not interfere with each other and without degradation of antenna performance. The picture shows the main VHF stack, which consists of two bays. Two diploes are used for transmit and two diploes for receive. The 7075, WREMO and Surf repeaters all share the receive pair.



The basic sharing or combining technique relies on number of bandpass cavity filters coupled together at a common point which is then connected to the antenna. Each cavity offers a low insertion loss at its working frequency while presenting a short circuit at all other frequencies. A quarter wave coax section transforms this short circuit to an open circuit at the common point to avoid interfering with the other signals sharing the antenna. The arrangement can be used for receive or transmit. On transmit, circulators prevent any leakage from the other transmitters that get pass the cavities from mixing in the transmitter final and causing IMD.



The common point is usually a collection of connectors often known as a spider. One spider being used at Colonial Knob can be seen circled in red in this picture, with unused N-connector ports covered with blue protective caps.

Conclusion

The Wellington VHF Groups and its AREC section has a strong history of commitment to public service and preparedness for emergencies. The work done at Colonial Knob to assist SAR partner SLSNZ and Civil Defence agency WREMO are the most recent demonstrations of this dedication. Thanks to Steve ZL2KG for the pictures used in this article.