The BROADCASTER

Newsletter of Telecom Broadcasting

No. 28 March 1994

MOUNT BARROW UPGRADE

THE BROADCASTER

The Broadcaster is the in-house newsletter of Telecom Broadcasting and is published three times a year to inform and recognise the people who make up this organisation.

Articles appearing in *The Broadcaster* do not necessarily reflect the views of the management of Telecom Australia.

Written and photographic contributions are welcome. All material should bear the contributor's name and location and be directed to:

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EDITORIAL

In his Letter-to-the-Editor, Doug Sanderson reports that the HF Inland service stations VLQ and VLM in Queensland and VLW in Western Australia have been closed down pending an analysis of response from the public concerning termination of the transmissions. This follows the closure of similar services VLI Sydney in 1983 and VLR/VLH Lyndhurst in 1987.

The establishment in 1928 by the PMG's Department Research Laboratories of an experimental short wave station and the success of the experiment was a major factor in determining the type of broadcasting service to best serve the nation.

The Radio Research Board formed in 1927, strongly supported a combination of long wave and medium wave stations to cover the nation whereas the Department favoured a combination of short wave and medium wave stations.

The Department's plan eventually became policy and served the nation well for many years.

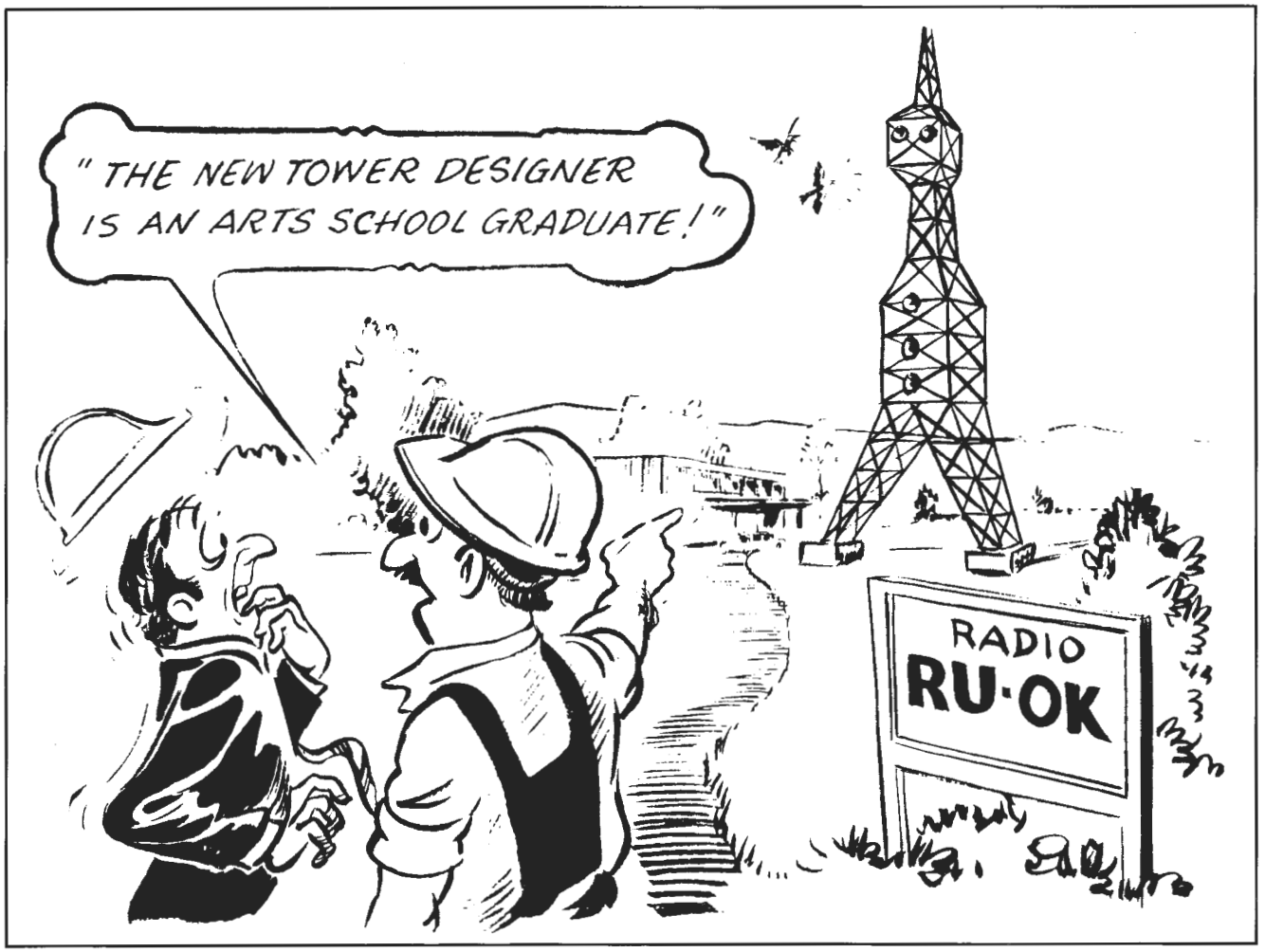
However, the declining use of the services by outback listeners, for a number of reasons, has resulted in these early HF stations being gradually retired from the broadcasting scene.

JACK ROSS
Editor

Front Cover: UHF module being hoisted for installation.

Contributors to this issue:

Les Rodgers	Cliff Moule	David Shaw
Wayne Croft	Tom Pascoe	Greg Tracey
Ralph Denison	Doug Sanderson	Richard Womack
Bob Horsley	Chris Scott	Jack Ross



Les Rodgers

JUST BRIEFLY . . .

Much has been written about Total Quality Management, Re-Engineering of processes to eliminate waste and duplication, Continuous Improvement, and all the other adjuncts of what is briefly described as "Quality".

For some time now, we have been moving down the quality path and invested a good deal of resources, financial and people, in training about quality. We have established a Quality Management Council and a Quality Manager position and produced a Quality Policy. Many of our people have been involved in the huge task of rewriting all our procedures for Operations and Maintenance and Engineering and Construction in a standard way.

We have prepared a Quality Manual containing all of these things and much more. We are now ensuring that all the procedures are followed throughout the organisation. After that, we will continually improve them in a standard way and hence, continually improve the standard of service that we offer.

All of this is formalised as a quality system defined in the Australian Standard AS3901 and the International Standard IS9001.

After being audited by an accredited authority, we expect to be accredited to AS3901 early this year. This will be an impressive achievement since we embarked on the plan to achieve accreditation less than 12 months ago and I know how much effort has been put into it. Being accredited to these standards is becoming a requirement to be eligible to tender for some contracts.

It is most important that all our people are thoroughly familiar with the contents of the Quality Manual and strictly observe the defined procedures which are aimed at setting out the best way of doing things. This will benefit both our clients and ourselves.

LES RODGERS

STATION ROLL CALL

ABQ2 BRISBANE

National TV Station ABQ2 is located on Mt Coot-tha approximately 8 km west of the city centre. Mt Coot-tha with its many parks, bush walking tracks, scenic lookouts and close proximity to the city is an ideal spot for the tourist and residents of Brisbane to spend many enjoyable hours in pleasant bush surroundings.

Television transmission commenced on 2 November 1959 using two Marconi type BD371A vision transmitters and two Marconi type BD325C sound transmitters operating in parallel. The combined output of these transmitters was then split and fed via Styroflex cables to an eight stack high gain Marconi antenna type BD773 mounted on top of a 154 metre tower. The Marconi filterplexers were replaced by new AWA colour filterplexers in 1975 as part of the colour conversion program.

Programs from the ABC Toowong studios were transmitted to the transmitter via a Marconi link. The link had the dish installed inside the equipment rooms and the signal was directed to the dish by passive reflectors mounted on the tower. The link was replaced in 1973 by a fully solid state GT&E link.

In May 1991, the Marconi transmitters were replaced by two NEC PCN-1410 10 kW parallel transmitters using all solid state components except for the final stage which uses one valve, type 8F76R. These transmitters are fully automated and are stereo sound compatible. Stereo sound was introduced to the ABC TV service in January 1992.

The Marconi high gain antenna was replaced by a Radio Frequency Systems antenna model 606L-20 in May 1992.

DAVID SHAW

FM SERVICES MT COOT-THA

The first FM broadcasting transmission in Brisbane was an experimental service operating from Mirrimbul across the road from the present ABQ2 site. It commenced operation on 6 October 1953 on 91.1 MHz using an REL transmitter with an output power of 1kW. The antenna was a folded dipole halo type horizontally polarised and mounted on a wooden tower. The transmitter was fed with the same program as 4QR via landline from the ABC studios in the city. The service ceased transmission on 30 June 1961.

In September 1980, the ABC Fine Music service commenced operation on 106.1 MHz using a NEC 10 kW transmitter type FBN-7150E and a Coel four bay broadcast V antenna installed on the SE leg of the TV tower at the 100 m level. The program is fed from the ABC Toowong studios via landline.

ABC Youth Radio service 4JJJ commenced transmission in November 1990 on 107.7 MHz. A 20 kW NEC transmitter type FBN-11K20E was installed and combined with the ABC Fine Music service and fed to the same antenna. Because the power rating of the Coel antenna was only 20 kW, the output of 4JJJ was reduced to 10 kW,

A new RFS FM antenna commission in mid 1993 allowed both the Youth Radio and FM Fine Music services to be transmitted at 20 kW. A new 20 kW NEC transmitter type FBN-11K20E was installed to replace the 10 kW FM Fine Music unit.

DAVID SHAW

NEW 50KW TRANSMITTER

UPGRADE OF FACILITIES-2CR CUMNOCK

Station 2CR Cumnock went to air on 29 April 1937 using a 10 kW STC transmitter on frequency of 549 kHz. In 1963, the STC transmitter was replaced with a 50 kW AWA BTM50 main transmitter and a 10kW AWA BTM10 standby. The site was manned until 1992.

Given the age of the equipment, and the need for reliable unmanned operation, action was taken to replace a substantial part of the station equipment. Cut over to the new plant was a gradual process which was completed during February 1994.

By demolishing the wall between the control room and the transmitter hall it was possible to create enough space to install a new 50 kW Nautel solid state transmitter and ancillary equipment without disturbing the old transmitters. A single rack was provided adjacent to the new transmitter for the program input and monitoring/control equipment. The new transmitter consists of two Nautel AMPFET ND25 fully solid state units and a combiner incorporates contactors for switching, instead of a manual patch panel. Should the power of one transmitter fall 3dB below the other transmitter, the faulty transmitter is automatically switched to test load, and the normal transmitter is switched directly to the antenna so that half its power is not dumped to the combiner absorber load.

The manufacturer carried out a design change to the control system so that the transmitter never forgot a VSWR fault. However, sooner or later the maximum number of faults is exceeded and the transmitter is permanently switched off. A solution to the problem is under investigation.

Cut over to the new transmitter was completed on 28 January 1994, but there was much to do before this could be effected.

A 300A Critec surge reduction filter was installed on the incoming power mains and modifications were made to the main station power board to accommodate the new transmitter, while maintaining the old transmitter on air.

Station earthing was refurbished and rearranged in accordance with company recommendations. As might be expected, the new solid state transmitters are more prone to lightning damage than the old vacuum types, but the manufacturer guarantees the reliability, provided their earthing recommendations are followed.

The existing air intake filtering system was retained, however a new exhaust duct and exhaust fan were provided for each transmitter.

New program input equipment and a new air cooled test load were installed as part of the upgrade work.

A Programmable Logic Controller was provided to control the transmitter and main switchboard. Its main functions are to automatically reduce transmitter output power if it is connected to the standby mast or the emergency power plant and to switch the full transmitter to the essential supply during a mains failure. This was necessary as the standby antenna system and the emergency power plant were not upgraded for full transmitter power.

The standby wooden pole mast was replaced with a 600 mm triangular cross section mast 75 m high, together with a new aerial coupling unit (ACU) manufactured by Telecom Broadcasting in Adelaide.

The open wire lines feeding the main and standby masts were replaced with underground coaxial cables. The main mast is fed by a 2 1/4 inch Andrew cable. The standby mast

New PIE and PLC Controller.

Transmitter load, instrument cart, old PIE and transmitter duct system.

is fed by a 7/8 inch Kabelmetal cable and is limited to 10 kW. The cables were buried directly in the ground at a depth of 500 mm in a bedding of sand. It is of interest that the original feeder installed in 1937 was an underground coaxial line.

A 3 1/8 inch three port patch was provided to allow manual patching between the main and standby mast.

Having replaced the standby antenna system and commissioned the new transmitter, these new facilities were put to air to enable completion of work on the main antenna system. The Nautel transmitter and coaxial line have a 50 ohm characteristic impedance whereas the impedance of the open wire lines was 200 ohms. The main ACU was rebuilt in situ to change the input impedance from 200 ohms to 50 ohms.

Tuning of the ACU's using a Delta Bridge and Potomac Synthesiser/Detector was difficult as the test signal from the Potomac Synthesiser was swamped by interference from other stations. The main ACU was tuned using 549 kHz from the new transmitter, however this abundant source of test signal is a potential radiation hazard. A radiation hazard meter was used to determine the maximum power that could be applied to the ACU without exposing staff to excessive RF level. In this case, the transmitter output was limited to 750 watts.

It was necessary to take the station off air between midnight and dawn on a number of occasions for tasks such as upgrading the power and earthing, and tuning of the ACU's. Where possible, these tasks were tackled simultaneously to minimise overall outage time. On other occasions transmission at low power was necessary.

CHRIS SCOTT

Nautel 50 kW transmitter.

Antenna and load patch panel.

New mast base.

NEW DARWIN FACILITY

ESTABLISHMENT OF DELORAINE ROAD BROADCASTING CENTRE

Up until recently, the City of Darwin was served by broadcast services originating from four separate sites, the 8RN service which transmits from the MF facility at Douglas St, the ABD6 TV & 8DDD Radio Regional Service which operate from the Telecom site at Blake Street, 8ABCFM & 8JJJ transmitting from an interim facility located at Hudson Creek and an UHF ABC TV translator transmitting from the Darwin CBD to serve the Northern Suburbs.

The temporary facility at Hudson Creek was established in 1988 to cater for the planned expansion of ABC FM services, after it was recognised that it was impractical to upgrade the Blake Street tower to accommodate any additional loading. It was realised at that time, that a purpose built broadcasting complex was required to meet the long term broadcasting needs of the Darwin community and in particular to house the proposed SBS TV and FM services.

The selection of a suitable site was complicated by environmental restrictions and approvals, the geography of the area, the location of the Darwin Airport and the presence of several Defence Department Communication sites. Apart from the normal planning and building approvals, extensive negotiations were conducted by NTA with the CAA and the Department of Defence before final agreement was reached between all parties concerned.

The site finally selected is located at Deloraine Road approximately 14 km east-north-east of Darwin. On-site construction work commenced in August 1993, with a target completion date for the SBS VHF FM & UHF TV services of 31 December 1993!

The facility comprises a 130 metre, two metre face width mast with a torsional stabiliser at the 45 metre level to provide structural rigidity and hence minimal rotation of planned link antennas. The VHF FM antenna is a SIRA FMC-03/12 four level three sided array being fed by two 4 1/8 inch Flexwell feeders. The UHF antenna is a SIRA UTV-01-24 eight level three sided array being fed by two 6 1/8 inch Flexwell feeders. Each antenna is designed for full load half antenna operation and in each case the horizontal radiation pattern has been tailored to minimise radiation to the previously mentioned Defence Communication Facilities.

The antenna systems, building and ancillary systems have been designed to cater for a final station configuration of 8 VHF FM services and 5 UHF TV services, and has been designed to operate under cyclonic conditions.

Initially, services to be established are the SBS FM and TV services. The SBS FM service became operational on Australia Day 1994 following the installation and commissioning of a 5 kW NEC transmitter, patch panel and splitter. Unfortunately the 10 kW SBS TV transmitter, also purchased from NEC, was damaged beyond repair during heavy seas encountered in transit. A replacement transmitter is due for delivery in March and it is anticipated that the SBS TV service will be commissioned and placed on test transmission during April 1994.

During the next few months, the existing 8DDD, 8JJJ and 8ABCFM services are to be relocated to the Deloraine Road site. In addition, the Hudson Creek facility is to be dismantled, however, the 8DDD equipment located at Blake Street is to be retained in order to provide full redundancy for this service.

The time frame within which the Deloraine Road facility is being established is extremely tight and the design and installation team involved in this project deserve special recognition for achieving the targets set by the National Transmission Agency.

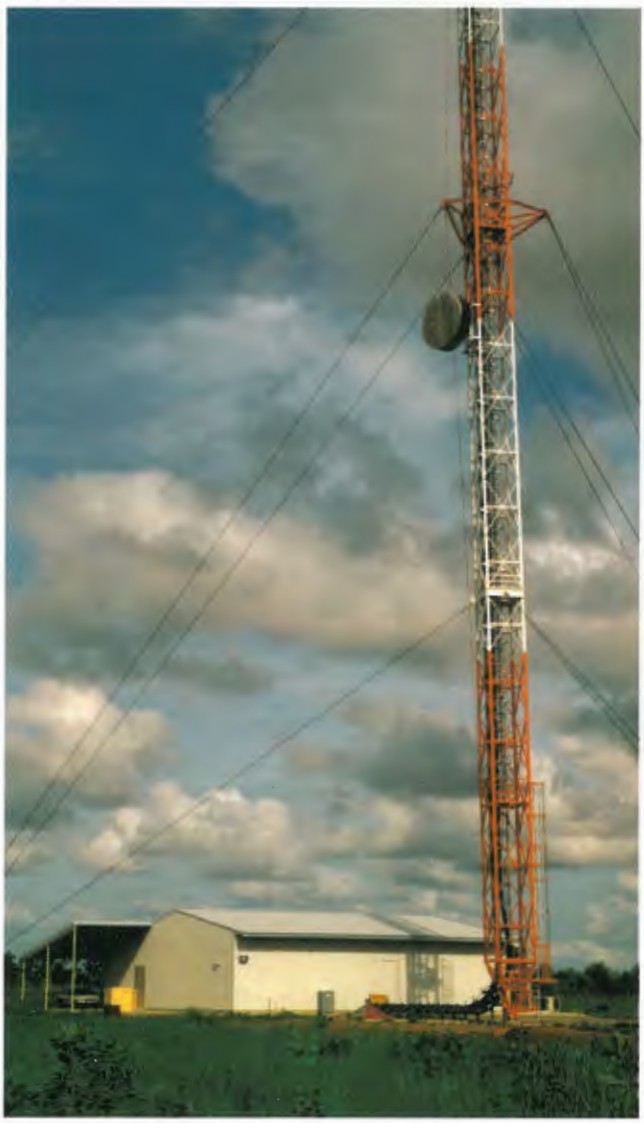
WAYNE CROFT

Mast construction in progress.

Building in early construction stage.

Cable tray for cable access to building.

SBS TV transmitter damaged in transit.



Mast torsional stabiliser at 45 m level.

Completed 130 metre mast with antenna systems.

4QS DALBY

Station 4QS Dalby was the third National Regional transmitter to be commissioned in Queensland when it went to air on 17 October 1939. Facilities included a 219 m radiator, a 10 kW STC water cooled transmitter and an above ground copper tube coaxial transmission line. The transmitter is linked to ABC studios in Toowoomba, the largest city in the service area.

The station is located on the fertile black soil plains of the Darling Downs and the service area covers districts in which farmers grow wheat, barley, sorghum, maize, cotton and millet. Cattle, sheep and pigs are raised in large numbers.

Grain silos which serve the fields, dominate the landscape of most towns.

Dalby is Queensland's biggest wheat intake centre and has one of the States largest municipal stock saleyards. Secondary industries include foundaries, flour mills, dairy factories, stock food plants and many industries that manufacture agricultural implements and parts.

4QS station building hidden amongst the trees with radiator in background.

One of the most interesting landmarks in the district is Jimbour House. Jimbour station, about 25 km north of 4QS was established in 1842. In 1844, Ludwig Leichhardt set out from the station to find an overland route to Port Essington in the Northern Territory. The original building was burnt down in 1867 and in 1874 work began on a two storey mansion of grand and sophisticated design, now one of Queensland's stately homes. Originally, there was gaslight in all the 20 odd rooms with the gas being generated from coal mined on the property. Water was pumped around the property by what was believed to have been the first windmills erected in Queensland.

BOB HORSLEY

Silos for storing barley. Each silo is 40m high and holds 2500 tonnes of grain.

Four wheel driven Steiger Cougar tractor.

Caterpillar tractor employing rubber tracks.

Scarifier machinery ready for road transport.

5PB AND 5RPH FACILITIES

UPGRADING OF FORMER COMMERCIAL STATION 5DN

Wingfield and Cavan are low lying areas, often dusty, but sometimes swampy wastelands north of the otherwise beautiful city of Adelaide.

The areas were selected many years ago as being acceptable broadcasting sites for some of Adelaide's medium power MF Commercial stations. Stations installed in the area include 5DN, 5KA and 5AD. It is of interest that the area was used for wireless telegraphy tests by experimenters as early as 1910.

Station 5DN was the first broadcasting station established in South Australia when it began operation during June 1924 at Parkside. Station 5KA was commissioned by Sport Radio Broadcasting Company Ltd on 25 March 1927 in Kintore Avenue, Prospect taking its call sign from the station address. The Advertiser Newspaper established 5AD on 2 August 1930 in a building in the centre of the city.

In later years, 5AD and 5KA shared facilities at Cavan but 5DN established its own at nearby Wingfield. Station 5AD is the only one of the group still operational on the MF band.

Around December 1989, 5KA relinquished its MF licence on 1197 kHz and acquired a new licence in the FM band, thus making it possible for the re-allocation of 1197 kHz to another service, 5RPH operated by a group involved in Radio for the Print Handicapped. For a few years up until July 1993, the sharing process continued at Cavan by agreement between the owners of 5AD and the new community service 5RPH.

The owners of 5DN made their move to the FM band around April 1992, and in so doing, made it possible for reassignment of 972 kHz to 5PB, the Parliamentary Broadcast Service. It was about September 1992, that 5PB was physically relocated to the former 5DN side at Wingfield and the transmission frequency changed from 1539 kHz to 972 kHz. Frequency 1539 kHz was an interim allocation while 5PB was being transmitted from a transmitter at the NBS station 5AN/5RN Pimpala.

Prior to these changes taking place, the National Transmission Agency had taken ownership of the Wingfield facilities and realised that the two services 5PB and 5RPH needed to be rationalised and concentrated at the one site. So the uneasy sharing of 5RPH with 5AD at Cavan was to cease with new and easier sharing between 5PB and 5RPH made on their own premises.

When 5DN operated from the site, there were two transmitters in a main/standby configuration, either switchable to a main or a standby aerial, an emergency diesel generating plant as a power backup and two stereo program line feeds via separate exchange routes from studios in North Adelaide.

The transmitters were both Nautel AMPFET10S types of early 1980's vintage. Whilst ready expansion to 10 kW was always possible, they had only been equipped for 5 kW, because the licence limited the operators to only 2 kW power.

To cater for the new services on the site some rearrangement and upgrading of facilities were necessary.

The 5PB mono service on 972 kHz now operates using 5DN's original main mast which is a 141 m omnidirectional radiator. Incidentally, it is worth noting that at some stage, 5DN management had contemplated a second similar mast, an increase in transmitter power, probably up to 5 kW shared between both which would have given a directional pattern with greater coverage to certain areas. The mast and guy pylons had even been driven into the ground in readiness for the second mast.

Station 5PB uses the original 5DN main unit operating on the same frequency and power. A new aerial coupling unit was designed and built partly because it was below required standard and partly because a rejector network for 1197 kHz had become necessary due to the much closer physical proximity of this other service.

A number of other changes were also required. They included a complete revamp of the aerial switching facilities to provide a simple change over between aerial and test load, a new program input equipment rack, relay of relevant alarms and controls to the MIC, and updating of the program line equalising equipment.

The 5RPH mono service on 1197 kHz is now transmitted by what was the 5DN standby mast 61 m high. The Broadcasting Lines staff re-guyed the facility during April-May 1993 because the original steel guy ropes had been weakened by corrosion resulting from years of exposure to a salt laden atmosphere. This mast is only 90 m away from the taller 5PB mast and as expected, there was considerable coupling between the two. The aerial coupling unit which had to be redesigned because of its new operating frequency had a 972 kHz rejector network built into it.

The transmitter employed was the 5DN standby unit. However, it had to be retuned to shift it from 972 kHz up to 1197 kHz. As for the other service, this was now a dedicated one transmitter to one aerial situation and the switching requirement again became simply a change over between aerial and test load.

Additional work comprised design and construction of a new program input equipment rack, extension of alarms and controls to MIC, and rearrangement of program lines and equalising equipment.

During July 1993, all adjustments of transmitters, aerial coupling units and PIE were in progress with cut over of 5RPH from the old site to the new being carried out during the last week of July 1993.

Aerial impedance measurements on the masts were very difficult to make at the Wingfield site due to the fact that at all times the 5UV service on 500 watts was only 500 m away and the 2000 watt 5AD station less than 2km away, with both being operational 24 hours a day.

Whilst staff have not yet had opportunity to conduct a full scale field strength survey around the countryside, it has been noted that the far field signal of 5RPH is 2 to 3dB less than than of 5PB. The relative efficiencies of the two quite different masts would easily account for this order of difference.

TOM PASCOE

NORTHERN TASMANIA

MT BARROW STATION UPGRADE

The first publicly tendered contract let by the NTA (NTA-002) was for the upgrading of broadcasting facilities in Northern Tasmania. This forms part of the last phase of the equalization program in Australia. The new facilities will provide two new TV services to Northern Tasmania - SBS and Tas TV and one additional FM service - ABC Radio Regional. The main site for Northern Tasmania is at Mt Barrow though the contract also involved the upgrade of nine other translator sites.

The site at Mt Barrow is considered one of the most inhospitable sites in Australia. The last few kilometres of the 15 km dirt track up to the site at 1400 metres is one way, combining very steep ascents with a series of hair pin curves passing through a landscape, completely devoid of vegetation, consisting of millions of small boulders piled precariously one upon the other. This section is also prone to snow and ice and is frequently shrouded in cloud. In January, while New South Wales sweltered in a heatwave and was ravaged by fires and while Tasmania, as a whole, experienced a cold, wet Summer period, at Mt Barrow frequent snow, very strong winds, cold and cloudy conditions hampered work.

Because of the extreme weather conditions known to prevail at Mt Barrow, special precautions have been taken to ensure the safety and well-being of the external plant staff. Staff were trained to recognise and prevent hypothermia. They were also issued with special clothing to ensure they stayed warm and dry. The training received in driving the snowplough was put to good use in hauling trucks up the hill in icy conditions. As one Queensland linesman remarked, 'Summer at Mt Barrow was the coldest Winter he'd ever experienced.'

The existing services at Mt Barrow, ABC Ch3 TV and Fine Music FM share the same antenna - FM being broadcast with only horizontal polarization. To clear the TV from the FM band, the ABC service is to change to UHF Ch32. Since the old AWA transmitters are near the end of their useful life, the timing is appropriate. The combination of 20kW transmitters and a 32 wavelength antenna was determined to be the optimum solution. The antenna has been constructed in four modules and, as specified by the NTA, each is individually powered by a 5 inch feeder.

The UHF antenna is a story is itself. Briefly, the Mt Barrow antenna and those for the translators were the product of Telecom Broadcasting and SIRA collaboraton. SIRA did the RF design and provisioned the RF components whereas Telecom did the mechanical design, fabrication and assembly. The Shepparton staff of the Engineering Services Section were responsible for the latter, with the Victorian Service Centre producing all the connecting cables. All assembly and manufacture was to AS2990, which proved to be a useful initiation into this standard of Quality Assurance. Range testing was done with the aid of Telecom Research at their test range at Caldermeade.

The UHF antenna is capable of operating six 20kW services. However, initially there will be only the ABC, SBS and Tas TV. These will be combined in a three input, expandable Passive Power Products wave guide combiner. Protection wise, this combiner is fully automated and will trip transmitters or switch-out one of the four antenna modules should a fault occur.

(Continued page 12).

Removing last of the radome panels.

Installing the first 5 inch UHF feeder.

Preparing to lift the bottom UHF module during Mt Barrow upgrade project.

(Continued from page 10)..

Due to the difficult mountainous terrain, it was decided that ABC TV should broadcast on both Ch3 and UHF for at least a year. This will enable the NTA to assess and provide any additional translators that many be required for the UHF service.

The NTA in their specification requested that, whilst maintaining the horizontally polarized Ch3 service, the FM should be broadcast with circular polarization into the same antenna. To achieve this, a special TV/FM combiner and FM splitter were required. These enable the TV and half the combined FM output to be fed into the horizontal dipoles, whilst the other half of the FM is fed into the vertical dipoles. As is standard, the antenna is also constructed in two halves. The net result is that four feeders are required and two antenna switch frames. To allow for up to 6x20kW FM services plus the Ch3 TV, 3 inch cables were chosen.

The original Fine Music 10kW transmitter is being replaced with a new 20kW one so that the horizontal ERP of the circularly polarized service remains unchanged. Likewise a 20kW transmitter is being provided for the new Radio Regional service. After retuning, the recovered Fine Music transmitter is to be used as a cold standby for the Radio Regional service.

The existing tower required upgrading to accommodate the UHF antenna on top. The UHF column, due to the structural requirement of including escarpment factors and revised wind codes, which result in much higher design wind speeds, took considerable design effort by Broadcasting Structures. It is without doubt the strongest column installed by Broadcasting anywhere in Australia with the bottom module being made of 26mm thick steel plate. Due to the cold temperatures experienced on the site, special low temperature high ductility steel was used. Both UHF and TV/FM will be covered by an electrically transparent fibre glass radome required to minimize the build up on the structure of snow and ice. For the same reason the tower is steel clad and the previous Ch3 antenna was also covered in a radome. The timing of the radome replacement was indeed fortunate as when it was removed, ingress of moisture in the wooden support structure was found to have severely weakened it, a defect that the new radome cannot suffer from as fibre glass structural members are being used.

The project has been very much a National effort. It reflects the new National Construction organisation and bodes well for the future of the organisation to be able to focus its widespread skills and staff on a challenging project. In every aspect, it has been a joint effort involving personnel from all States and the National Office. For example, the drafting was carried out by staff from Queensland, Victoria, South Australia, Western Australia and the Northern Territory while the installation team included people from Queensland, Tasmania, Victoria, Western Australia and New South Wales. The Melbourne Office handled the tender submission, documentation and, most importantly, the customer contact with the NTA.

RICHARD WOMACK

Radome removed and new cable gantry installed.

UHF feeder drum being placed on jacks.

OUR BROADCASTING PIONEERS

MR S F (FRANK) BROWNLESS

Frank Brownless, a Londoner, was educated at Ealing Grammar School, with an early schoolboy interest in building radio receivers and attending Logie Baird's public TV displays in 1927. Later, at Regent Street Polytechnic he constructed his first TV receiver employing a 30 line mirror drum! After four years as a laboratory assistant with various radio manufacturing companies, plus part time study at London University, Frank graduated with B Sc (Hons) Degree in 1936.

Frank Brownless.

Joining the British Broadcasting Corporation as a Maintenance Engineer he was sent to the Daventry HF Broadcasting Centre where the Centre was beginning an expansion program to install twelve 100 kW transmitters. Following three years there, he acquired a great deal of practical experience on high power transmitters, HF feeders, switching systems, aerial design and overhauling 750 kW diesel generating plant. He also gained experience in demountable valve technology by taking part in the conversion of a surplus Baird TV transmitter for HF operations.

At the outbreak of the War in 1939, coastal radar facilities for coverage of the UK comprised 20 stations of 250 kW (peak) power with the transmitters employing demountable valves. Air Ministry staffed the stations with Resident Engineers with four including Frank being seconded from the BBC. Subsequent posting to HQ 60 Group Fighter Command found him working under Group Captain Proctor Wilson who had also been seconded from the BBC.

Frank's work included upgrading RF feeder systems and increasing the performance of the lower power 200 MHz coastal stations detecting low flying aircraft, replacing insulators where practicable by quarter wave stubs and other activities. Frank was commissioned as Flight Lieutenant and became involved with many important projects and investigations.

Returning to the BBC in 1946, Frank became a Senior Research Engineer developing transmitting aerial designs for forthcoming TV and FM services. In particular, his joint patents for folded slotted-cylinder FM arrays resulted in these aerials being deployed below the TV aerials at most BBC high power stations. To broaden experience, Frank transferred to the Audio Section in 1948 working on distortion and listeners' loudness preferences.

Post War restlessness and increasing links with Australia, resulted in Frank joining the PMG's Department in 1949 as base grade Engineer and in 1951 being promoted Divisional Engineer in the Central Office Radio Section under Horrie Hyett. Projects included pulsed tone testing and selection of monitoring loudspeakers for ABC studios, field tests of synchronised repeater for 3AR at Bendigo and a range of standardised easily constructed emergency aerials for the NBS.

In 1956, Frank joined the Australian Broadcasting Control Board as Sectional Engineer Television preparing standards for TV stations and applying them to the initial and regular inspections of the rapidly increasing number of Commercial stations. Transmitting aerial pattern specifications were derived to meet the ABCB team's coverage plan and site selections for a 12 channel VHF TV network.

By 1965, colour TV was well established in the USA using the NTSC system while the Europeans were divided favouring in Britain, NTSC; in France, SECAM and in Germany, PAL. The Board sent Frank on three months tour to study the systems. On return, he recommended that on balance, PAL was the most suitable for Australian conditions. As the evidence built up, the ABCB made this recommendation to Cabinet who decided in 1969 to introduce colour using the PAL system. With the system chosen, there was still the huge task of specifying all the new equipment and changes to existing plant. Unlike 1956, there was now a flourishing industry with a pool of expertise in public and commercial organisations. At a packed industry meeting, it was decided to set up a Television Industry Technical Advisory Committee (TITAC) with a steering committee coordinating working parties on transmitters, links, studio equipment, recording etc. The meeting elected Frank, recently promoted Asst Director, Planning as Chairman of the steering committee. At its peak, TITAC had over 300 active engineer members and detailed operating standards were established in good time for colour service in 1974.

Frank succeeded Alec McKenzie as Director Technical Services in 1969, but not for long. Returning from lecturing at a CCIR meeting in Malaya in 1970, Frank suffered a severe heart attack from which he never completely recovered. Returning to duty after six months, he opted to resume his earlier position as Assistant Director. Here he was able to continue with studies of FM services and their interaction with TV.

Frank was retired in 1978 on medical grounds, but still capable of part time work he 'tapered off' as a Consultant to amongst others, Philips, Channel 9 Network, SBS and Capital TV. He finally retired in 1988, to pursue his hobby of hi-fi loudspeaker systems for the domestic scene.

Frank was a member of the RMIT Communications School Advisory Committee for over 20 years; a committee member of the Melbourne Division of the Institution of Radio and Electronics Engineers, Australia for over 30 years; Chairman of the IREE 1969/70 and National Council Member for some years. His contributions to the advancement of radio engineering have been acknowledged by many awards including, Mention in Despatches (RAF 1943), Queens Jubilee Medal for public service, Award of Honour from the IREE 1989 and others.

JACK ROSS

LETTERS TO THE EDITOR

Contributors to Letters to the Editor are reminded that full names and addresses must be supplied. Letters should be brief and to the point. Long letters may be edited. The Editor's decision in respect of the suitability of letters for publication in *The Broadcaster* is final and no correspondence on the Editor's decision will be entered into.

Sir

Brisbane short wave transmitters VLQ and VLM ceased transmission in mid December 1993.

At midnight on 17 December 1993, audio and carrier were cut with no announcement.

The VLQ, 10 kW STC 4-SU-48B transmitter on 9660 kHz and VLM, 10 kW STC 4-SU-12A transmitter on 4920 kHz had served the Queensland section of the Australian Inland HF Service for half a century and it was a sad occasion to stand in the Transmitter Hall at the Metropolitan Radio Centre, Bald Hills on the afternoon of that day and hear these stalwart units for the last time.

Often when listening to VLM on my Hammarlund HQ145, I would think that perhaps I was the only listener in Queensland at that time. What a joy to have a personal 10 kW transmitter!

The Western Australia service VLW operating from Hamersley near Perth on 6140, 9610 and 15425 kHz with two 10kW STC 4-SU-48B and one 50 kW STC 4-SU-61 transmitters has also been closed down with the service ceasing on 22 January 1994.

Recently, Radio Netherland broadcast a segment of the Inland HF Service in their regular short wave listeners program. State Managers of the Australian Broadcasting Corporation in Brisbane and Perth and yours truly, spoke on the origins of the service, how it has performed and now, due to a declining audience, why decision was made to close the service. Over the years, there have been many overseas listeners and this was an appropriate way to tell them of the closure.

The VLW service first went to air on 1 December 1939 to provide service to remote areas of Western Australia. During the 1950's, facilities were expanded with an additional transmitter being provided. During 1962/63, new transmitters were provided, with facilities including two 10 kW units and one 50 kW unit.

The VLQ service went to air in 1943 with a water cooled 10 kW transmitter. A replacement unit was installed in 1968.

The VLM service began operation on 7 September 1949 with a 200 watt transmitter which was replaced by a 10 kW unit in 1951.

DOUG SANDERSON

VLW 10 kW STC type transmitter installed 1962/63.

Matchless ML6427 valve with horizontal cooling fins employed in VLW 50 kW transmitter STC type 4-SU-61.

Water pump system original VLQ installed 1943.

STC 10 kW type A880A transmitter installed VLQ 1943.

Part of early short wave aerial system at Bald Hills employing Oregon support masts.

ANTENNAS FOR RECEPTION OF TV SIGNALS

Ever since television was introduced to the Australian scene in 1956, studies by technical staff responsible for investigating problems with reception of television signals have revealed that many viewers tolerate a far lower standard of reception than they need to, because they have little appreciation of the basic measures necessary to ensure good reception. The incorrect selection of antennas, bad installation and poor maintenance are major contributing factors.

A walk through many neighbourhoods will highlight a number of installations which would be providing an inferior service. It is not unusual to observe some types installed back-to-front because of lack of knowledge of technical matters on the part of some do-it-yourself owners.

Over the past 38 years, since the first transmission of black and white pictures, the technology has made rapid advances in both the video and aural components of the service. The black and white picture has been replaced by colour and stereo sound is available with many receivers. Viewers expect to benefit from improvements made in studio and transmitter technology, and designers of receivers and home antenna systems have been improving their equipment for collecting and distributing the television signals to ensure the viewer obtains the best possible performance from the overall television chain.

In 1956, advertisements in technical publications showed that a wide range of antennas were available for the start of the program of equipping Australian homes for reception of television signals.

One of the early manufacturers was Hills of Adelaide, at the time, manufacturers of the famous Hills Hoist. The antennas were a 'flip open' design which enabled assembly to be carried out in a matter of only seconds. Types available included:

. Folded dipole-a three element wideband unit covering all licensed bands.

. Fan model-also a wideband unit covering all licensed bands.

. Combination Yagis-a combination Channel 2 with Channels 7-9 units also available.

. Five element Yagi-with units available for Channel 2 and Channels 7-9.

. Ten element Yagi-with units available for Channel 2 and Channels 7-9.

. Loft model-covering Channels 1,2 and 6-9.

. Indoor model-suitable only for high signal strength, low interference areas close to the transmitter.

Today, the company trading as Hills Industries Ltd, produces a much wider range and superior product to meet modern demands of advanced technology for television reception. The basic groups of antenna covering presently allocated frequency requirements include:

. Single channel VHF or UHF Yagis designed to cover one channel spacing only. While such a design will receive other adjacent channels, a rapid roll-off in performance is observed.

. Wideband Yagis. While the single channel Yagi is designed to roll-off in performance on either side of a specific frequency spectrum, in some cases it is expedient to extend this narrow coverage. For instance, in the UHF Band, where some required frequencies occur in Band 4, (Channel 28) and others are located in Band 5, it many be expedient to use only a single antenna.

Horizontally polarised UHF phased array and vertically polarised VHF Yagi.

Horizontally polarised UHF Yagi and vertically polarised VHF Yagi.

Horizontally polarised VHF Yagi and vertically polarised VHF phased array.

(Continued from page 16).

To provide such an extended coverage, the parasitic elements are staggered in their spacing and the element's lengths are varied. As this in turn causes the overall gain to be reduced, additional elements must be provided to regain the previous performance parameters.

. Combination VHF Yagis. A high band Yagi can be combined with a low band Yagi and their folded dipoles connected by coupling bars which have been arranged to match the impedance of both dipoles.

In addition, the low band dipoles can be used to reinforce reception on the high band by the use of a high band resonator placed close to it.

This applies where a third harmonic relationship exists between the low and high band frequencies, such as is the case with Channels 2 and 7/9.

. Colinear VHF Yagis. By using a colinear reflector and colinear directors, together with a three half wave dipole with high band resonator, the result is to produce virtually three high band Yagis side by side.

The resultant high gain and good directivity, help to solve high band ghosting problems.

In this type of antenna, a low band dipole and low band reflector provide adequate low band gain in most situations. On the high band, the colinear reflector can be seen with the resonator and low band dipole to be giving the characteristic of three Yagis, side by side.

. Log Periodic antenna. Hills Telray range of television antennas are designed to cover the VHF band, Australian channels in Bands 1 and 3, together with FM radio frequencies (or the old Band 2).

The design incorporates a basic log periodic driven section with additional parasitic elements which are provided to increase the gain and improve directivity to Band 3 where the performance of the driven section would decline.

. Combination Log Periodic/Yagi. With the advent of the SBS service on Channel 28 and Band 4, co-located on the transmitter tower with the previous Band 1, Channel 2 National service, in many situations, a need developed for the provision of a combined VHF/UHF antenna.

The answer to this situation was to combine the VHF Telray with a TC10 Band 4 antenna. The driven elements were combined in a circuit assembly and a common boom used to support both sets of elements.

. Phased Array VHF and UHF. The phased array is based on two colinear dipoles arranged as a pair, so that their signal voltages combine and add together in value.

A similar arrangement placed to their rear acts as a reflector. Stacked in a series of four vertically, with each pair of elements being interconnected to its neighbour by the use of a phasing harness. This results in a high degree of forward gain without the narrowing of the reception lobe as is the case for a Yagi type of comparable performance. At UHF such an arrangement provides for a relatively wideband, medium gain (12dB) antenna, with very compact mechanical parameters.

In compiling this article, I am indebted to Bruce Moore, National Sales Manager, Antenna and TV Systems of Hills Industries Ltd for supply of information on company products and to Bill Castle, also of Hills Industries Ltd, for use of material in the publication 'Antenna Installation and Television Systems Manual'.

JACK ROSS

UHF phased array, horizontally polarised Yagi and broadband VHF antenna.

Horizontally polarised and vertically polarised VHF antennas.

UHF Yagi, VHF Yagi and wideband vertically polarised VHF antennas.

70th ANNIVERSARY

ESTABLISHMENT OF BROADCASTING IN AUSTRALIA

Included amongst a number of functions throughout Australia during November last year to celebrate the 70th Anniversary of the establishment of broadcasting in Australia, was one held in Port Macquarie in New South Wales.

About 90 enthusiasts of the 'Golden Days of Radio' attended a function in the Rushcutter Room of the Port Macquarie RSL Club on Saturday 20 November 1993.

The organiser, Bernard Harte a former Technician, Chief Engineer and Manager in the Commercial broadcasting industry, in describing the historic event commented.

"Never again, shall such an assembly of old timers gather together for an Anniversary celebration".

Those in attendance included former technical staff of National and Commercial stations, announcers of ABC and Commercial stations, Managers, and Peter Burgis retired member of the National Film and Sound Archive. Speakers included James Dibble, former well known ABC news reader; Bert Button, former 2GB and Macquarie Network Manager; Jack Conry former Manager 2KA Katoomba; Jim Angel, 2UE Network; Ray Rumble, former Manager 2KM studio in Port Macquarie and many others.

The guests were entertained by the Allan Wright Trio and included Penelope Evans on piano, Allan Wright on cello and Robyn Butler singer, with a musical program of numbers which were hits when broadcasting began 70 years ago, many of which are still popular today. Recorded programs from various archival sources featuring celebraties of bygone years including Dad and Dave, Mrs 'Obbs, Jack Davy, Bob Dyer, Amateur Hour, Roy Rene (Mo), George Foster, George Wallace and others.

Gordon O'Brien, former station Manager 2KM Kempsey played the part of Postmaster General William Gerrard Gibson and read the speech which was delivered during the official opening of 2SB on December 1923. The local Museum operated by Hastings Historical Society mounted a special display of vintage receivers, including the first receiver brought to Port Macquarie, components, magazines and early photographs, to mark the occasion. It was very popular with visitors to the Museum.

The station which marked the commencement of broadcasting 2SB (later 2BL) was owned by Broadcasters (Sydney) Ltd a group of radio retailers and major Departmental stores. The station is still operating today transmitting the ABC Regional/Metro Radio program.

Before the licensed 500 watt transmitter was commissioned, tests were carried out using a 10 watt transmitter owned by the Managing Director of the new station, William Maclardy, an active Amateur experimenter.

During the tests, reception reports were received from other States including Victoria, Tasmania, South Australia and Queensland, even though power was only 10 watts input to the final stage.

The 500 watt transmitter was built by local enthusiasts and installed on top of Smiths Weekly Building in Phillip Street, Sydney. Space for the transmitter, generating plant and a modest studio was proved by the building owner, Sir Joynton Smith.

Test programs were broadcast from 13 November 1923, and from 20 November full scale transmissions were soon extended to 12 hours daily with programs being provided in Sessions, separated by periods of no transmission.

In 1929, the station was taken over by the Government as part of its plan to establish the National Broadcasting Service.

Today, 2BL transmits on 50 kW into the aerial and is located at Preston near Liverpool where it shares a dual frequency radiator and building with Radio National transmitter 2RN.

JACK ROSS

EARLY WORK IN SOUTH AUSTRALIA

In 1957, staff at the Adelaide NBS studios were given the opportunity to try out some of the ideas which were appearing in the technical literature concerning stereo broadcasting technology. Occasionally, two studios used by the ABC were free, and these were used to undertake a program of tests.

Studio 520 was set up with three microphones and two OB amplifiers via tie lines, plus normal studio output circuits. All circuits were fed to monitoring amplifiers and speakers in studio 510. Staff soon became familiar with new terminology such as 'binaural', '2 or 3 channel stereo sound', 'hole in the middle' and others. Outstanding sound effects were performed by Ted Penny, particularly the sound of passing high speeds trains.

The first on-air tests involving the two metropolitan transmitters 5AN and 5CL was scheduled for early May 1959, with the transmitters being used after the cessation of normal programs. ABC Announcer, Toby Symonds had been busy for some days preparing a suitable script for the presentation, but at short notice Toby had to go to Sydney. Technical staff were determined that the show must go on, so one of the staff stepped in, and without a script, gave listeners some idea of what was going on and how to arrange two speakers in the home to obtain maximum benefit from the broadcast. Another member of the technical staff played discs from the control booth.

There was a delay of some months before stereo transmissions became a regular part of normal ABC programs. Because the two local transmitters were not equal in output power, (5AN was 4dB down on 5CL), the experimental Adelaide FM mono transmitter and 5CK Crystal Brook, the nearest regional transmitter were fed with the same program as 5AN to provide better coverage, particularly for mid-north listeners.

The stereo broadcasts ceased after about a year because both the ABC and the PMG's Department were busy with the establishment of TV and the construction of a new metropolitan transmitting centre for 5AN and 5CL at Pimpala. However, by the mid 1960's, the ABC was asked to make a few commercial stereo recordings which required shifting a lot of portable outside broadcast equipment to the two orchestral venues then available at the Adelaide Town Hall and studio 525 at Norwood.

In early October 1968, a mixer unit referred to by technical staff as the 'green monster' arrived. The name was appropriate. It was 710 mm wide and extremely heavy. It included all valve equipment, many large iron core transformers for inputs, output and power. Each side - left and right - had a mixture of low level microphone and line level inputs with the usual master volume and balance controls, so the front panel had an impressive array of knobs. It was accompanied by a large and heavy packing box for transport of the unit to and from other States. Later, a companion mixer, the 'blue monster' arrived so OB operators were back to pre-war days with transportable equipment so bulky and heavy that even two operators struggled to cope with movement operations.

From 1972, Graham Milne played a key role with stereo recording operations when the Adelaide Festival Theatre became available as another recording venue. One of the notable recordings made at the Festival Theatre was Peter Sculthorpe's 'Rites of Passage'.

The ABC were able to transfer all remaining activities from the City to their new building at Collinswood, an Adelaide suburb, by October 1975, with all production studios being equipped for stereo operation just prior to the start of regular stereo programs in January 1976 to transmitters in Adelaide, Canberra, Melbourne and Sydney employing FM Stereo mode.

CLIFF MOULE

Mixer unit used in 1960's for AM stereo broadcasts and recordings.

BROADCASTING MILESTONES

2LG LITHGOW

Station 2LG Lithgow was commissioned on 3 October 1949 with a pair of AWA 200 watt transmitters operating in main/standby mode. The installation is unique in that the radiator, a 36 m lattice steel Deeco mast is situated on a hill about 213 m from the transmitter building and about 71 m above the level of the building. A 50 ohm coaxial feeder type UR67 laid in a pipe links the transmitter to the radiator. Staff associated with the installation and early operational activities include Frank Reid, Alan McInante and Dave Spillett.

Lithgow is about 150 km west of Sydney and lies 975 metres above sea level in the Blue Mountains. It is well known for a number of reasons including the Government small-arms factory, one of the largest precision engineering works in the southern hemisphere, steel fabrication, coal production, clothing and textile manufacturing.

The town first became important with the discovery of coal but it had to wait for the arrival of the railway before industry became established. This included brick and pottery works, meat chilling factory and establishment of an ironworks which produced the first steel in Australia in 1900. Although the steel works expanded rapidly, operations were transferred to Port Kembla in the late 1920's. A major present day tourist attraction in the district is the zig-zag railway which when constructed in the 1860's was considered to be an engineering masterpiece.

It was replaced in 1910 by a series of tunnels but reopened by steam train enthusiasts in 1974.

In 1982, the original transmitter installation was replaced by an AWA transmitter type BTM-P5 as main and a J61650 type as standby. Program was received off air from Portland where the program terminated on landline from Orange.

On 1 December 1993, the transmitters were replaced by a single solid state Nautel T400 transmitter producing 250 watts into the aerial.

GREG TRACEY

Lattice steel radiator installed on hill above transmitter building.

Transmitter building 2LG Lithgow erected 1949.