

History Archive - Issue 3: April 2018 (see also issues 2 and 1 last updated 2011, time moves slowly in the Heritage World)

<http://www.rtonline.com/wirelessheritage.html>

## Mr Marconi and Mr Fisk 100 YEARS OF RADIO



Ernest Fisk at Home Courtesy of ABC Radio National Australia

This article is a longer version of an RTT April 2018 Technology Topic on Beam Radio (how short wave beam radio served the empire and laid the foundation for today's RF beam shaping technologies) but focussing specifically on the 100<sup>th</sup> anniversary of the first radio transmission between the UK (Waunfawr near Caernarfon) and the Amalgamated Wireless Australasia (AWA) radio station at 'Logan Brae', Pymble, an adjacent suburb to Wahroonga, near Sydney, part of a local authority area named after the indigenous Guringai people.

The Ku-ring-gai Historical Society is organising a celebration to mark the centenary of the transmission and reception of the first direct wireless message from UK to Australia to which you are invited.

### Read on

This first 'official' message was a Morse code exchange on 22<sup>nd</sup> September 1918 sent under the direction of Marchese Guglielmo Marconi from the Right Hon. William Morris Hughes PC, KC, Prime Minister of Australia. The message was transmitted from Caernarfon and was received by Ernest Fisk, head of AWA, at the experimental wireless station attached to his residence "Lucania" (close to the Logan Brae staff house) on the corner of Cleveland and Stuart Street now marked by the monument pictured below.



**Monument erected in 1935 to mark the first long distance wireless transmission from Caernarfon (Carnarvon) to New South Wales. Pictures taken by Jo Harris on the occasion of the 75<sup>th</sup> anniversary 25 years ago.**

<http://monumentaustralia.org.au/themes/technology/industry/display/23624-fisk-memorial>

<https://makinghistoryatmacquarie.wordpress.com/2013/11/23/the-historical-significance-of-the-wireless-monument-in-wahroonga/>

William (Billy) Hughes had returned to the UK after reviewing the Australian Armed Forces in Amiens, France, a politically sensitive visit given the horrific losses suffered both by the Australians and other commonwealth and allied forces; largely it was felt due to poor British leadership and decision making.

There were actually two messages, the first at 1.15 pm Sydney time (3.15 am Greenwich Mean Time)

"I have just returned from a visit to the battlefields where the glorious valour and dash of the Australian troops saved Amiens and forced back the legions of the enemy, filled with greater admiration than ever for these glorious men and more convinced than ever that it is the duty of their fellow-citizens to keep these magnificent battalions up to their full strength. W.M. Hughes, Prime Minister."

And the second at 1.25 pm Sydney time (3.25am Greenwich Mean Time) from the Minister of the Navy Joseph Cook who had accompanied William Hughes on the trip. This refers in part to a problem selling Australian farm produce to the UK.

"Royal Australian Navy is magnificently bearing its part in the great struggle. Spirit of sailors and soldiers alike is beyond praise. Recent hard fighting brilliantly successful but makes reinforcements imperative. Australia hardly realises the wonderful reputation which our men have won. Every effort being constantly made here to dispose of Australia's surplus products. Joseph Cook, Minister for Navy."

Cook and Hughes both took part in the Peace Conference and negotiations marking the end of the Great War in November 1918.

### **Marconi and the Biggest Transmitter in the World**

<http://www.qsl.net/vk2dym/radio/Marconi.htm>

Using radio to reach Australia in 1918 required a 400 kilowatt long wave transmitter which Marconi claimed at the time was the biggest in the world. Powered from a nearby hydroelectric power station, the Waunfawr transmitter was located on the top of the Cefn-du Mountain in Snowdonia and coupled to ten 400 foot masts. Locals remarked that snow never settled near the site due to the heat from the power and transmission lines, a snowless Snowdonia.



### **The Waunfawr Transmitter site on top of Cefn-du**

MountainMountain<https://geotopoi.wordpress.com/2010/08/14/marconi-long-wave-transmitting-station-cefn-du-waunfawr/>

Marconi's Wireless Telegraph Company had established its first factory in Chelmsford, Essex in 1898 moving into a larger factory just down the road in 1912. The Caernarfon transmitter was built in 1914 with a receive site in Tywyn on the coast some miles south and played a crucial role in providing a war time radio telegraphy link with the US. The allies had successfully disrupted submarine cable connections to and from Germany and Germany at least theoretically could have done the same to us so having an alternative communication capability was considered vital (though British dominance at sea, both in terms of the Royal Navy and cable ships made this unlikely).

Achieving a service directly with Australia only became feasible due to advances in vacuum tube receivers developed for military radio equipment (and radio broadcasting) but these long wave radio transmitters were extravagantly inefficient in terms of bandwidth occupancy and power consumption and costly to run and repair.

The receiver was the first to be manufactured by AWA but closely followed Marconi's design using a tuning coil and variable capacitor to give a tuning range of 10 KHz to 30 KHz (30 kilometre to ten kilometre wavelength). The Caernarfon transmitter was tuned to 21 KHz (14.3 kilometre wavelength).

Incidentally by 1922 it was confirmed that long wave signals travelled more efficiently on a great circle route of maximum darkness between the stations either over a short path or the long path (the reciprocal path). The optimum short path between the UK and Australia was (still is) 15,300 kilometres across Asia with an optimum time of 7.30 pm in Caernarfon and 5.30 am in Sydney with both cities in darkness. The secondary optimum path occurs at 6.00 am in Caernarfon and 4.00 pm in Sydney with the signal travelling over the long path (20,800 kilometres) over South America and the Antarctic. Long path VLF signals become stronger from about midday in Sydney in September so receiving a transmission after lunch was retrospectively a good decision.

The messages were sent several times at 15 minute intervals with the messages transcribed into a Morse code log book (now in the Mitchell Library)

<http://www.sl.nsw.gov.au/research-and-collections-about-our-collections/david-scott-mitchell-library>

Atmospheric noise then increased to the point where no more transmissions could be detected (1918 was a peak year in the 11 year sun spot cycle).

Needless to say, neither Billy Hughes nor Navy Minister Cook were present at 3.00 am in the morning on a cold wet Welsh mountain. Their messages had been sent the previous day by wireless and cable from London. As there was no way of replying from Pymble, a cable was sent to England to confirm receipt.

The September transmission can be regarded as both technically and politically significant.

Born in Wales, Billy Hughes served as the seventh Prime Minister of Australia from 1915 to 1923 and was Australia's longest serving Prime Minister until overtaken by Robert Menzies in 1956 and remains the longest serving parliamentarian in Australian history (51 years). Hughes was an enthusiastic support of new technology and founded the Advisory Council for Science and Industry, the forerunner of the CSIRO (Commonwealth Scientific and Industrial Research Organisation). At the other end of the radio communications scale, it was radio astronomers working at the CSIRO who invented Wi-Fi many years later.

<http://primeministers.naa.gov.au/primeministers/hughes/fast-facts.aspx>

<https://www.csiro.au/en/News/News-releases/2016/Revolutionary-Wifi-invention-selected-for-World-in-100-Objects-ExhibitionNews-Release>

Despite the achievement of the 22 September 1918, it was becoming clear that the days of using long wave for transatlantic wireless transmissions were numbered. A chain of long wave repeater stations, the option preferred and promoted by the British Government, would have been expensive, slow and unreliable.

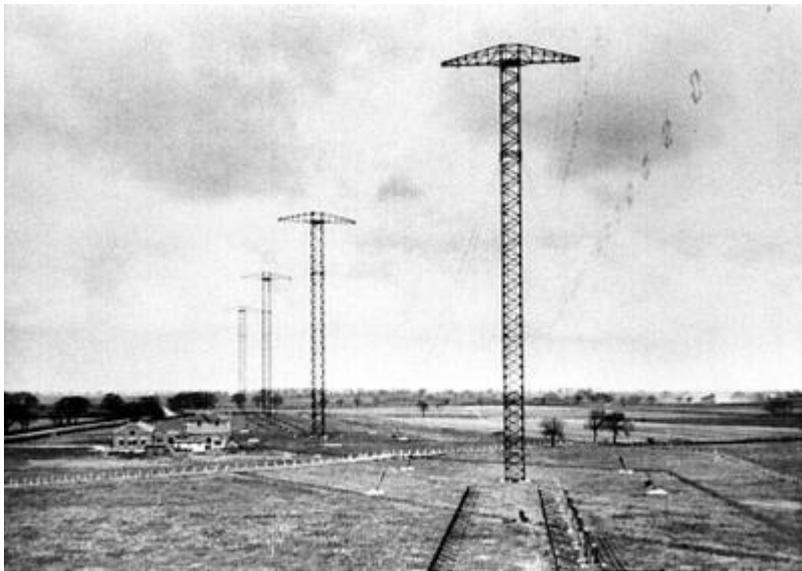
Experiments by Marconi in 1923 suggested that the answer was to move to short wave and to use antenna structures to shape the radio beam to send more radio frequency (RF) energy in the right direction and less RF energy in the wrong direction.

These short wave radio transmission techniques provided the basis for the radio stations built by the Marconi Company for the British Post Office known as the Imperial Wireless Chain though Marconi

also built his own transmitting station at Dorchester with a receiving station 30 miles north-west at Somerton. In December 1927, the short wave 'beam radio' (SWB) service to New York was inaugurated followed by a route to South America, Japan and Egypt and then Bangkok, Nairobi and Tehran.

The frequency range was 3-30 MHz equivalent to a wavelength of 100 to 10 metres and the antenna arrays were realized as stacked dipoles suspended from triatics attached to 90 foot wide cross arms on top of 287 foot high lattice steel masts. These are often called Franklin Beam Aerials in honour of their inventor, Charles Samuel Franklin. The transmitters were linked to the aerials by coaxial feeders, another of Franklin's inventions.

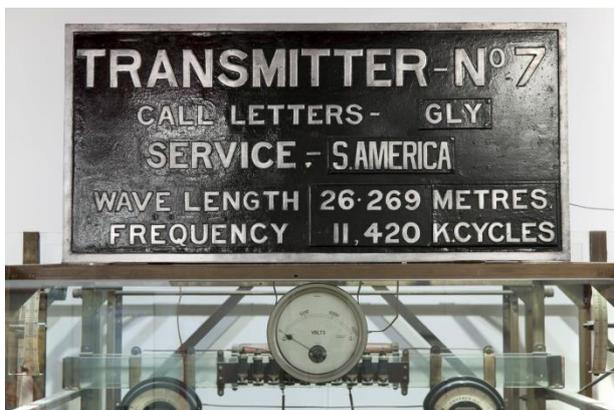
<http://ethw.org/C. S. Franklin>



#### **The Short Wave 'Beam Forming' array at Dorchester**

The transmitters used paraffin cooled power valves with copper to glass seals achieving an output of 11 kilowatts (compared to the 400 kilowatts of the Waunfawr long wave transmitter).

A sensitively restored but largely original example of the short wave transmitter used to communicate with South America, working at a centre frequency of 11.42 MHz (26 metres) can be seen at the Science Museum in South Kensington. It remained in service for about 40 years.



**Transmitter Number 7 short wave beam (SWB) telegraph transmitter of the Dorchester Radio Station manufactured by Marconi's Wireless Telegraph Company Ltd and on display on the second floor of the Science Museum in South Kensington – image reproduced by permission of the Science Museum/SSPL**

The technical and commercial success of these short wave beam (SWB) radio services meant that the cable companies became less viable though still considered as strategically critical.

As a result, a political decision was made in 1928 to merge communications with the British Empire into one operating company, originally Imperial and International Communications Ltd, later renamed Cable and Wireless Ltd. The Marconi Company had the resources to contribute financially to this merger, drawing on the income from government payments for the use of Marconi patents and technologies during the First World War. At this point (1928), short wave radio systems carried about half the world's international telegraph traffic with the other half delivered by long wave radio and submarine cable.

The principle and practice of beam forming continued to be developed across a range of applications including radar in the Second World War and anti-missile missile systems in the Cold War.

In 1962, the launch of Telstar and the Satellite Communications Act marked the beginning of a gradual transition from long distance terrestrial radio to long distance links via satellite. Early Bird, launched into geostationary orbit in April 1965 delivered 'TV and telephone and telegraph and high speed data', the world's first quad play platform.

Over the following fifty years satellites have become incrementally more bandwidth and power efficient due to improved RF hardware including spot beam antennas. The ability to deliver RF gain efficiently at higher frequencies has allowed operators to implement high throughput satellites in Ku and Ka-band and very high throughput (terabit) satellites in V and W band.

Bandwidth efficiency has been improved by a combination of frequency reuse and band sharing. The new generation of high count low earth orbit constellations are designed to co share frequencies with existing GSO operators though there is an ongoing debate about inter system protection ratios.

In parallel, 5G terrestrial radio is moving mobile broadband towards beam forming as a mechanism for improving power and bandwidth efficiency. Many of the beam forming algorithms are already in widespread use in automotive radar.

Contemporary innovation in 5G terrestrial and satellite systems can therefore be considered as a continuation of a 100 year process. Improved RF components allow higher frequencies to be used which in turn improves bandwidth efficiency through frequency re-use or, more controversially, frequency sharing.

In 1928, short wave beam radio provided an alternative to submarine cable with a lower cost base and reduced end to end delay. In 2018, inter satellite switched LEO (low earth orbit) satellite constellations provide an alternative to long distance fibre with a lower cost base and reduced end to end delay (radio waves move faster in free space and slower in fibre. Sending a message over a Low Earth Orbit satellite constellation for example in Ku or Ka- band or V and W band is therefore faster than sending the same message over terrestrial/sub marine fibre paths of more than 10,000

kilometres. A long wave transoceanic transmission has inherently less end to end delay than the equivalent fibre path.

It is therefore not just a story of moving to higher frequencies. Existing GSO (geostationary) and LEO satellite constellations in L band and S band are being upgraded to deliver higher data rates and a range of other added value capabilities (including LEO based positioning and location services) and new super small satellites are being used to provide low cost IOT connectivity and rural and remote voice messaging. Myriota providing connectivity to the Australian outback from small cube SAT operating in the UHF band are a contemporary example.

<http://myriota.com/>

### **But back to Mr Fisk and the heady early days of short wave beam radio.**

By the mid 1930's the Amalgamated Wireless Company was one of the largest companies by value on the Australian Stock exchange. The wireless services were nationalized in the Second World War due to the strategic importance of wireless communication but the manufacturing operation remained independent. AWA remains today ranked as one of the top 100 companies by value on the Australian stock exchange.

After a brief period running EMI in the UK after the war, Ernest Fisk returned to Australia and set up a running and fitness club and cigar club, uniting two of his personal interests. His family remain actively involved in commemorative events relating to AWA and the role of radio in consolidating Australia's increasing prosperity and economic strength in the post war years.

Incidentally the concept of nationalising radio assets considered strategically vital to economic growth remains in the forefront of contemporary regulatory policy in Australia. The National Broadband Network, a \$48 billion dollar investment combining 4G LTE mobile and fixed broadband radio and two geostationary satellites is government owned. (See also additional end note page 12).

On September 22 1993 the Wahroonga Amateur Historical Radio Society, call sign VK2WAH, the Ku-ring-gai Municipal Council and dignitaries from AWA and the Fisk family, along with children from local schools, commemorated the 75th Anniversary of the Marconi/Fisk radio transmission at the site, "Lucania". Later, wireless contact was made from the Wahroonga home of Mrs. Jo Harris, call sign VK2KAA, with the Dragon Amateur Radio Club in Wales, operating from the Welsh site of the Marconi transmitter and using the amateur call sign GB2VK.

25 years on, Jo is organising the 100<sup>th</sup> anniversary with a new call sign (yet to be revealed) aided and abetted by the Hornsby and Districts Amateur Radio Club and the Ku-Ring-Gai Historical Society.

<http://www.hadarc.org.au/>

<https://www.khs.org.au/local/localHistory.html>

Displays will open at 11 am in the church hall opposite the monument and the re-enactment ceremony will commence at 1 pm with a relay of the 1918 message, immediately followed by a welcome and a display of historic radio equipment and demonstrations of old and new methods of communications.

You are all then invited to tea and cakes. The catering bandwidth (and budget) of the KHS and HADARC is however not limitless so if you are interesting in attending or supporting the event in any way then you should email or text

Jo Harris OAM for the Organising Committee and Vice President KHS (Ku-ring-gai Historical Society)

Mob: 0408439343

Email: <mailto:jayaitch@optusnet.com.au>

The idea of this document is to provide a mechanism by which people or organisations who would like to support this event in any way (for example by sending a message on or before the day) can inter-communicate.

With permission, we list below in no particular order people, companies and organisations with an interest in old and new radio together with any particular affiliations to historical events involving Mr Marconi and or Mr Fisk

## **Contacts in the UK**

### **The Cambridge Wireless Heritage Special Interest Group**

This is a group of individuals who organise events most of which are free which look at particular aspects of radio history in the context of contemporary radio innovation.

<https://www.cambridgewireless.co.uk/groups/wireless-heritage/>

One of the group, Stephen Haseldine is a founder member of the Radio Communication Museum of Great Britain based in Derby

<http://radiocommunicationmuseum.org/>

#### **Contact**

[Stephen.Haseldine@radiocommunicationmuseum.org](mailto:Stephen.Haseldine@radiocommunicationmuseum.org)

### **The Science Museum, Kensington**

The Science Museum has one of the world's largest and most important collections of radio equipment. The Information Age Gallery traces 200 years of innovation in information and communications technology

<https://www.sciencemuseum.org.uk/see-and-do/information-age>

#### **Contact**

[John.Liffen@sciencemuseum.ac.uk](mailto:John.Liffen@sciencemuseum.ac.uk) Curator Emeritus

[elizabeth.brunton@sciencemuseum.ac.uk](mailto:elizabeth.brunton@sciencemuseum.ac.uk) Curator of Technology and Engineering, Science Museum

<https://www.linkedin.com/in/elizabethbrunton/>

Liz wrote her PhD thesis on institutional innovation in the early years of the wireless industry and has undertaken research on Marconi at the Bodleian library.

<http://blogs.mhs.ox.ac.uk/innovatingincombat/author/orie1518/>

The Science Museum has a well-structured and effective [Patron Scheme](#)

If you are interested in becoming a patron and supporting the Museum's work on radio technology restoration and curation contact

[Nicholas.Spindler@ScienceMuseum.ac.uk](mailto:Nicholas.Spindler@ScienceMuseum.ac.uk)

### **The Dragon Amateur Radio Club, Anglesey and North Wales**

<https://dragonradioclub.wixsite.com/darc>

#### **Contacts**

The club secretary John [mw0jwp@yahoo.com](mailto:mw0jwp@yahoo.com)

Club Chairman Simon [M3SET@yahoo.co.uk](mailto:M3SET@yahoo.co.uk)

Club Special Events Manager Steve [steve@gnsstonework.co.uk](mailto:steve@gnsstonework.co.uk)

The Dragon Radio Club will be awake and on air in that damp hut in Snowdonia at 3.00 am on the morning of September 22. I am sure you would be most welcome to join them although afternoon tea in a sunny Sydney suburb may be marginally more appealing.

### **The Chelmsford Museum, Chelmsford**

Chelmsford is the original site for the first two Marconi factories (1898 and 1912). Many ex Marconi employees still live in or near Chelmsford and a good few of them still work in the radio industry.

<https://www.chelmsford.gov.uk/museums/>

**Tim Wander - curator at the museum**

<https://marconibooks.co.uk/about.php>

<https://www.linkedin.com/in/tim-wander-3317b738/>

### **Chelmsford Radio Amateur Society**

<http://g0mwt.org.uk/>

Contacts in Chelmsford

[chrisvneale@gmail.com](mailto:chrisvneale@gmail.com)

<https://www.linkedin.com/in/chris-neale-a2291b5/>

### **Contacts in Australia**

## **Ku-ring-gai Historical Society**

<https://www.khs.org.au/local/localHistory.html>

Mrs Jo Harris [jayaitch@optusnet.com.au](mailto:jayaitch@optusnet.com.au)

## **Hornsby and Districts Amateur Radio Club**

<http://www.hadarc.org.au/>

John Bishop, President

[jbishop@ihug.com.au](mailto:jbishop@ihug.com.au)

## **The ACMA- the Australia Communications and Media Authority**

Mr Mark Loney, Executive Manager, Operations & Services Branch at the ACMA, has been extremely helpful identifying initial contacts in Australia

[Mark.Loney@acma.gov.au](mailto:Mark.Loney@acma.gov.au)

## **The Wireless Institute of Australia**

<http://www.wia.org.au/>

Representing the interests of the radio amateur community in Australia

Contact Justin Giles-Clark

[justingc@ozemail.com.au](mailto:justingc@ozemail.com.au)

## **Ericsson Australia**

Ericsson is one of the principle vendors and contractors for the Australian National Broadband Network (NBN). In 2005, the company acquired key assets from the devolved Marconi Company.

<https://www.ericsson.com/en/press-releases/2005/10/ericsson-to-acquire-key-assets-of-marconis-telecommunications-business>

## **Contacts**

David Cooper is Head of Networks, 5G and IOT at Ericsson Australia PTY Ltd and New Zealand and a member of the 5G Working Group established by the Australian Ministry for Communication. David also worked for Marconi in the UK, Asia and Australia for 15 years.

[david.cooper@ericsson.com](mailto:david.cooper@ericsson.com)

[Daina Fahey- head of communications](#)

[daina.fahey@ericsson.com](mailto:daina.fahey@ericsson.com)

## **Jock Given**

**Professor of Media and Communications at Swinburne University of Technology**

Jock has undertaken research at the Marconi Archive at the Bodleian Library in Oxford as well as Australian sources including Peter Fisk, Chief Executive of the National Measurement Institute and Ernest Fisk's grandson. The National Film and Sound Archive has a recording of the [message from](#)

## **[Marconi that was played in Sydney at the unveiling of the monument on the 14<sup>th</sup> December 1935](#)**

in addition to the actual transmission between Wales and Wahroonga.

**[jgiven@swin.edu.au](mailto:jgiven@swin.edu.au)**

This is a short article by Jock about Ernest Fisk with some great images

**<http://www.abc.net.au/radionational/programs/archived/hindsight/empire-state/4739816>**

### **Other contacts**

#### **My cousin Tony Varrall and his wife Anne**

Residents of Turramurra (adjacent to Wahroonga)

Had it not been for Anne mentioning the Fisk Monument when I stayed with them last October I wouldn't be spending Easter producing this over long document but I am grateful both for their wonderful Australian hospitality and friendship and for sharing with me their local knowledge and contacts.

**[tavarrall@optusnet.com.au](mailto:tavarrall@optusnet.com.au)**

#### **Australian political contacts with a local or radio interest**

##### **Alister Henskens, the state member for Ku-Ring-Gai**

**<http://www.alisterhenskens.com.au/news/ku-ring-%1Egai-historical-society>**

##### **Paul Fletcher**

**<https://www.linkedin.com/in/paufletchermp/>**

**Member for Bradfield and formerly Director of Corporate and Regulatory affairs at Singtel Optus**

Senator the Hon. Mitch Fifield

Minister for Communications

Parliament House

Canberra ACT 2600

Senator Fifield is also Minister for the Arts and, as such, has portfolio responsibility for the National Maritime Museum, a potential venue for a Sydney base event because of the maritime link to early radio development (The sinking of the Titanic 1912 and the Safety of Life at Sea Convention 1915).

#### **UK Political contacts with a local or radio interest**

Vicky Ford, MP for Chelmsford

**<https://www.vickyford.uk/>**

### **Other Resources**

#### **Australia**

**<http://www.abc.net.au/radionational/programs/hindsight/empire-state/3793124>**.

#### **UK**

#### **Waunfawr, Caernarfon- The Biggest Transmitter in the World**

**<http://www.bbc.co.uk/programmes/p025041n>**

## Errors and Omissions

**This document draws on a number of resources which I hope are reliable but the sources are secondary rather than primary so may contain inaccuracies and inconsistencies.**

I would be grateful if you could advise me of factual errors or errors of omission

With thanks

Geoff Varrall

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[https://www.linkedin.com/in/geoff-](https://www.linkedin.com/in/geoff-varrall/)

[varrall/https://www.facebook.com/geoff.varrall?ref=br\\_rs](https://www.facebook.com/geoff.varrall?ref=br_rs)

<https://twitter.com/geoffvarrall?lang=en-gb>

**The following additional detail has been kindly supplied by**

### **Overseas Telecommunications Veterans Association (OTVA)**

The National Broadband Network (NBN) is a \$48 billion dollar investment which employs a Multi-Technology Mix (MTM) in its access network. NBNCO Pty Limited is a Government Business Enterprise (GBE).

The MTM consists of the following components to connect End-User premises to up to 121 Points of Interconnect spread across Australia with up to 85 Access Seekers that have engaged NBN to supply services to their End-User customers (EU) and with whom Wholesale Broadband Agreements (WBA) have been signed:

Fibre-To-Node (FTTN) – These services utilise the copper cable network that NBN purchased from Telstra in conjunction with the NBN fibre network to gain access to premises over the last kilometre;

Fibre-To-The-Building (FTTB) - These services utilise in-building copper cabling in conjunction with the NBN fibre network to gain access to in-building premises

Fibre-To-The-Curb (FTTC) - These services utilise the copper cable from the street in conjunction with the NBN fibre network to gain access to premises;

Hybrid Fibre Coaxial (HFC) – These services utilise the coaxial cable network that it purchased from Telstra/Foxtel in conjunction with the NBN fibre network to gain access to premises

Sky Muster Satellite – These services utilise via two geostationary satellites operating over the equator in conjunction with 10 satellite earth stations built by NBN to connect the satellite network to the NBN fibre network. NBN has outsourced the management of this network segment to Ericsson Australia.

Fixed Wireless – The NBN has built a LTE/4G mobile network with a RX/TX antenna affixed to End-User premises that connects to the NBN fibre network to deliver Broadband communications to said premises. NBN has outsourced the management of this network segment to Ericsson Australia.

Thanks also to David Solomon for his earlier factual corrections on the same topic, now edited in to Page 7.

[david.solomon@optusnet.com.au](mailto:david.solomon@optusnet.com.au)