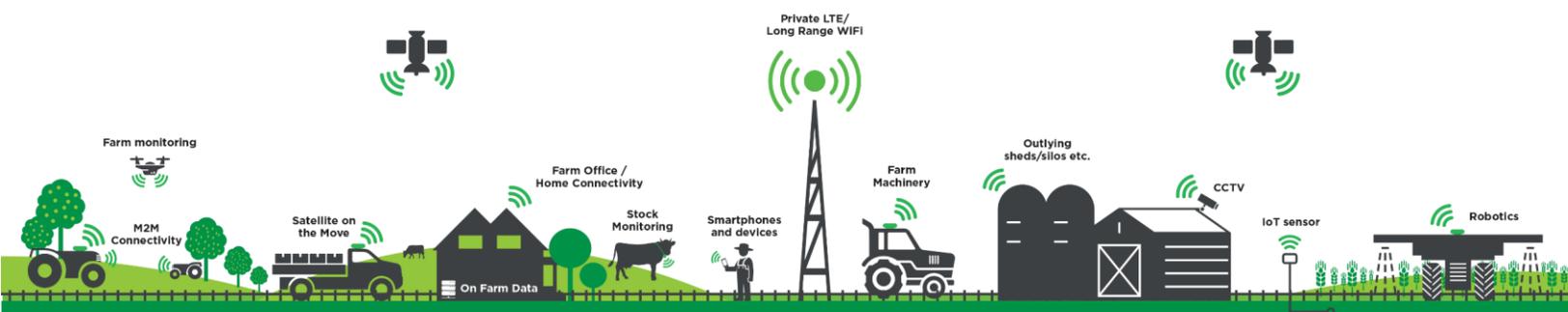


ACMA options paper

1800MHz/2GHz bands review of planning arrangements outside of spectrum licensed areas

Prepared by Connected Farms

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Introduction

Connected Farms welcomes the consultation work the ACMA is conducting to review and test options to respond to identified under-utilisation of spectrum reserved for mobile network operators (MNOs) in the 1800MHz band and a shortage of spectrum for non-MNOs in some areas of the 1800MHz and 2GHz bands.

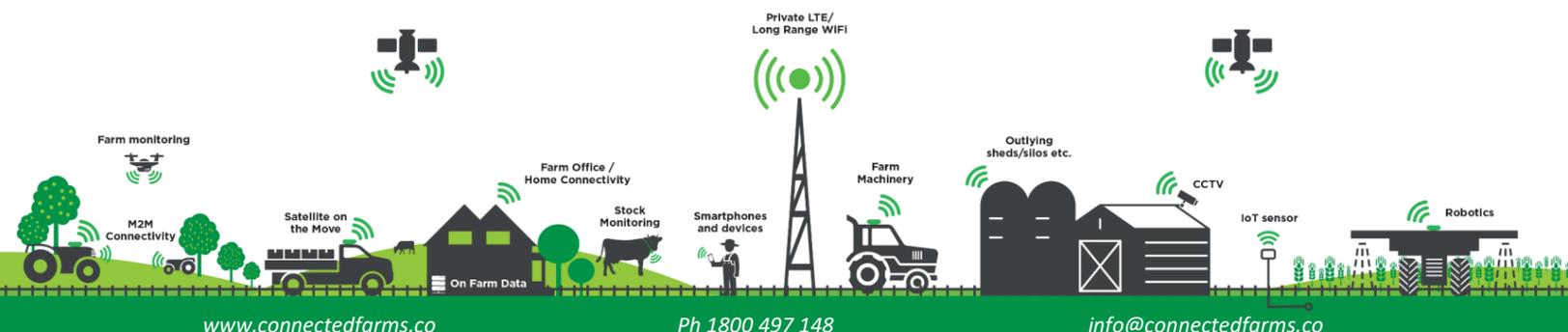
Connected Farms supports the ACMA's initiative and case for action to revisit planning arrangements for 1800MHz and 2GHz to ensure there is better alignment between current planning policy and spectrum demand. We also encourage the ACMA to continue work to address opportunistic licence applications and unused spectrum holdings.

Based in Regional NSW, Connected Farms is an Australian-owned licensed carrier specialising in on-farm connectivity technology designed and customised for agricultural applications throughout Australia. Our solutions give farmers the means to increase their yields and reduce their inputs by enabling digital agriculture. We enable wide-area mobile (4G) broadband, narrowband IoT (LoRaWAN) and satellite on the move (SoTM) mobility connectivity across the farm which allows growers to adopt digital agriculture. Digital agriculture cannot be adopted without accessible on-farm connectivity.

Comments on the analysis of spectrum utilisation in the bands and spectrum supply issues

Connected Farms supports the ACMA's analysis which found that supply and demand in the 1800MHz band for PTS is unbalanced, with a shortage of supply in non-MNO segments which are heavily used in certain areas and under-utilisation of MNO segments.

From a technical perspective, we concur with the ACMA's comment that both 1800MHz and 2GHz bands have similar uses and propagation characteristics. However, operationally, in rural and remote locations the propagation characteristics of 1800 and 2GHz (bands 1 and 3) remain sub-optimal for



agriculture use cases. In such use cases sub 1GHz spectrum is preferable to maximise the signal propagation over vast distances. Similarly, while area-wide licensing in the 3.4-4GHz bands is available to non-MNO operators, the characteristics of the band mean that it is not a good technical fit for rural and remote agricultural settings or a financially viable solution for Connected Farms use cases (due to the increased amount of infrastructure that would be required to cover larger farming areas). In the absence of non-MNO operator access to low band spectrum, the 1800 and 2GHz apparatus licensed bands remain critical to the ability of Connected Farms to service and connect agricultural farmlands.

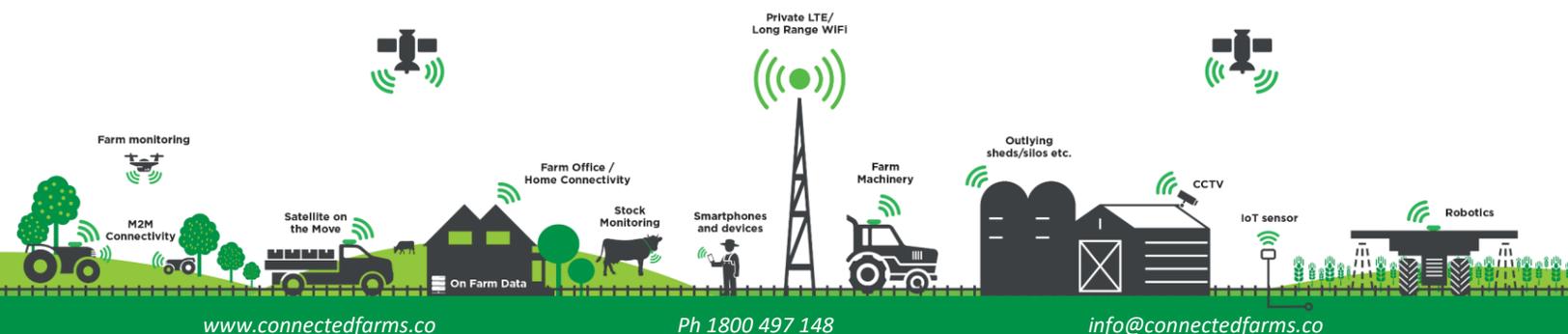
Connected Farms supports the need to better align policy and allocation settings across the two bands and across RALIs MS 33 and MS 34. The different and often conflicting policy settings currently in place inhibit the ability of operators to develop viable use cases and meet unmet demand in rural and remote locations. These settings also create market uncertainty and barriers to entry due to inconsistent and unreliable access to these spectrum bands. Current arrangements require that an 1800Mhz channel prescribed to an MNO cannot be licensed by another party even if that channel is unused in the desired operating area, whilst a 2GHz channel in an MNO preferred block can be licensed by another party if it is free to be used in a desired area.

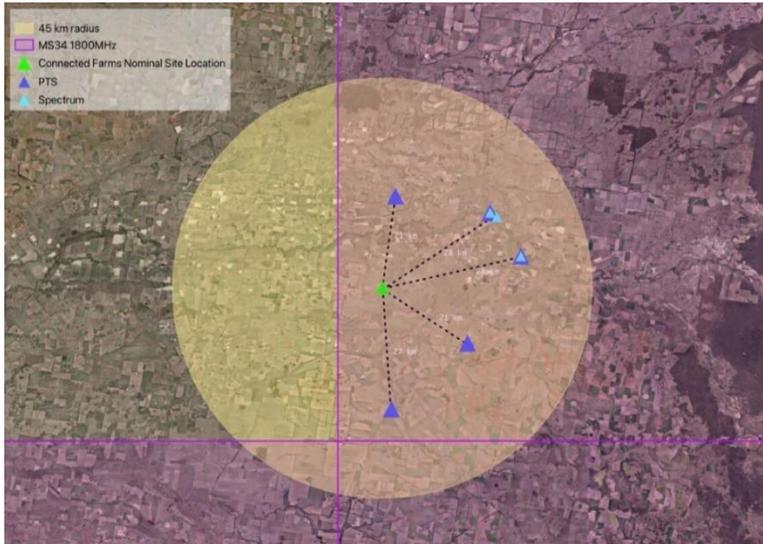
We have set out below, two separate case studies from agricultural uses cases which detail the operational impacts in rural and remote locations of the different policy settings and challenges in obtaining access to either 1800MHz or 2GHz. We have applied details of the ACMA preferred Option 2 to these examples to test the operational effect of proposed changes to policy settings and allocation arrangements.

Case study 1 – spectrum availability and operational impact of Option 2

In a remote northern NSW site location, we have experienced difficulties in obtaining access to apparatus licensed spectrum in bands 1 and 3 (1800MHz and 2GHz respectively) due to the limitations of current RALI and planning documents and lack of available channels.

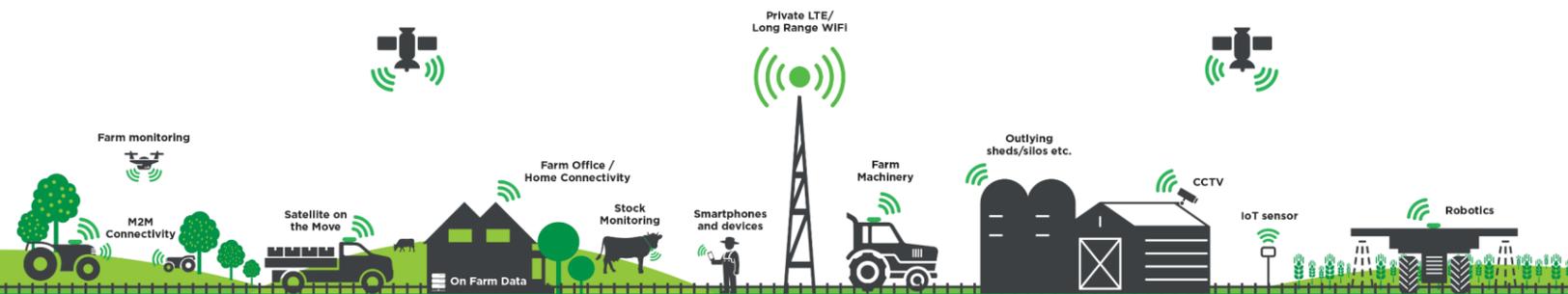
For this particular location and site:





Note: of the six PTS available licences in this area, five are held by MNOs, despite also holding ESLs.

- The image above shows both apparatus and spectrum licensed services (triangles)
- The preferred Connected Farms site location (green triangle) and most of the required coverage area is within the 1800MHz band spectrum licences only zone, so no 1800MHz channels are available for apparatus licensing (and this would remain the case regardless of the outcomes of the options paper)
- Some of the 2GHz band is available for PTS apparatus licensing (4 x 10MHz channels or 8 x 5MHz channels).
- With the current minimum separation distance of 45km between PTS base stations of different licensees (i.e. no frequency re-use within 45km) all licensable 2GHz band channels are already assigned to exiting services within 45km of the desired site, meaning there are no options for new PTS licence systems.
- If Option 2 were implemented, we have modelled the proposal to reduce the ‘no reuse’ radius to 30km. In this case, it would provide no net benefit to obtaining and using spectrum, as all licensable 2GHz band channels are already assigned to exiting services within 30km of the desired site.



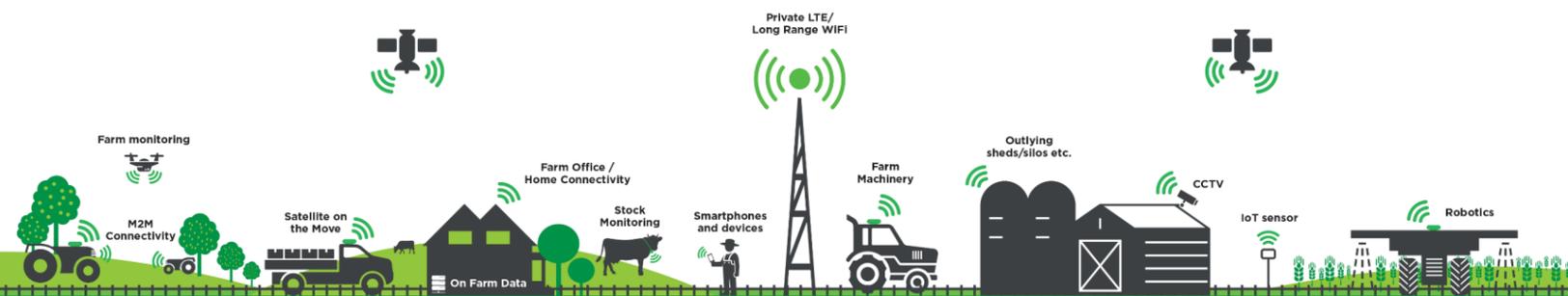
- We have also modelled the reduction of the ‘no reuse’ radius to 20km. One licensable channel is already assigned within 20km, and one channel assigned at 20.6km. A new licensed service at the desired location may be possible, but with all the available channels still in use within 30km, an assignment might not meet the current RALI MS33 PTS base station to PTS mobile receiver protection criteria. We did not undertake any co-channel protection criteria pass or fail as part of the case study; we have assumed the applicability of current protection ratios would be reviewed by the ACMA as part of any change to ‘no reuse’ distance.
- While assessing the benefit of reducing the reuse radius for this site location and within the context of spectrum availability, it is worthwhile noting that of the six existing PTS apparatus licensed services, five are assigned to MNOs, effectively locking out alternative providers from delivering services in the PTS bands, despite the MNOs also holding national low band spectrum licences (which remain unused or under utilised in certain locations).

Case study 2 – spectrum availability and operational impact of Option 2

At a rural northwestern Victorian site, spectrum availability is currently limited to one 5Mhz channel due to both the 45km re-use policy and the inability to access 1800Mhz MNO prescribed channels. Under an Option 2 scenario, our modelling indicates that reducing the radius to 30km would allow for more channel availability, in addition to being able to access all 1800MHz channels (with channel blocks being changed from MNO prescribed to MNO preferred in Option2). A net outcome here would be benefits in channel availability and efficiency of channel allocation.

Comments on the case for action, desired planning outcomes and analysis of policy elements

On balance, Connected Farms supports the ACMA’s preferred Option 2, although we would encourage the ACMA to set review dates for monitoring of band use and opportunistic licensing activity. We support the introduction of over-the top licensing to help address supply issues and the introduction of an ‘associates test’ to be used when applying spectrum limits. While we are encouraged by these proposed changes to the policy planning settings, in some locations these changes will have little net impact on the availability and use of these bands.

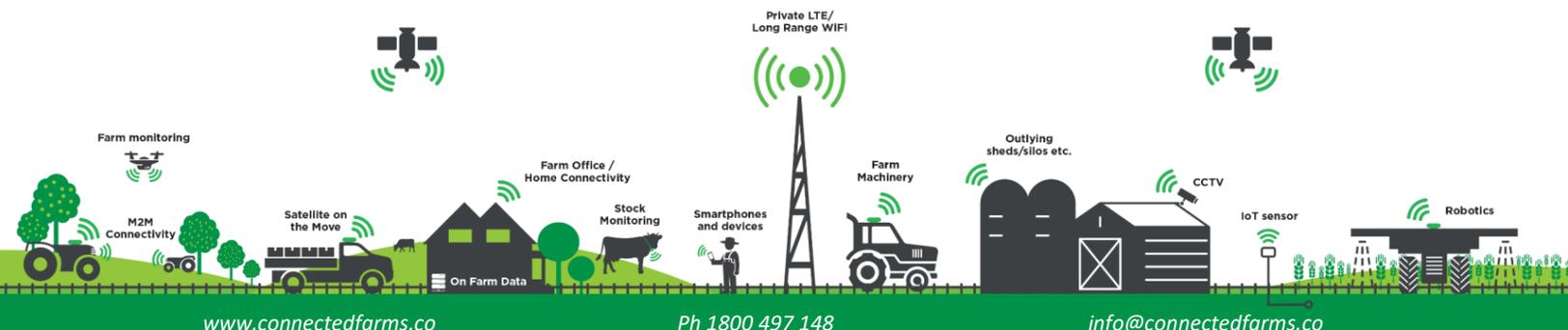


As the ACMA has noted, opportunistic licence applications and unused spectrum remain a policy challenge. Inefficient spectrum use has significant impacts on the ability of operators to meet unmet demand and the lack of certainty acts as a barrier to entry across different sectors and markets. Current apparatus licensing arrangements are being challenged to accommodate and respond to changing demand and use case profiles for spectrum across different industries and sectors, including agriculture. While specialist operators have different business models that are place based rather than population based, the pricing and allocation arrangements for rural and remote locations are based around population density that may not have regard to the growth of industries and sectors in these locations.

A number of factors are contributing to this policy challenge; namely, a PTS pricing model that is based on a \$/MHz/population model that is resulting in a number of perverse outcomes. Connected Farms suggest that the \$/MHz/population model will become an increasingly less accurate and relevant proxy for spectrum demand, particularly in rural and remote locations and in areas of high industrial or agriculture activity but low population density. Increasing mechanisation and automation across these industries, combined with spectrum uncertainty and low cost / high value PTS licences (and a presumption of licence renewal) may mean that opportunistic licensing is adopted.

The PTS population density-based pricing model is also delivering other anomalous and inefficient outcomes. For example, Connected Farms has a site where an agriculture customer desires a private network over a small geographic area and this area falls within a high population HCIS level 2 cell. In this circumstance, the licence cost is disproportionately high as the site falls within this HCIS cell category. The licensee is paying a significant premium for the licence which is only being used across a low population area, while the current reuse policy means that the channel cannot be reused within 45km, regardless of the small population.

Generally, the presumption of licence renewal and the low annual renewal cost of licenses in rural and remote locations means that licensees have little incentive to regularly review their licence holdings and assess the economic benefit associated with maintaining licences for non-operational sites. It is not uncommon for Connected Farms to identify a PTS licence held at a particular location with interference diagnostics failing to identify an operational signal. Within the context of the policy challenges articulated above, Connected Farms would like to better understand how the ACMA intends to continue to resource and monitor use in bands over time as set out under Option 2. We consider this ongoing activity to be a critical element in spectrum supply and to assessing the effectiveness of



Option 2 ongoing. More broadly, existing existing spectrum allocation policy does not incentivise efficient use of spectrum across all bands, meaning that vast areas of agricultural land remain unserved. Proactive management of underutilised spectrum across all key PTS licensed bands would enable organisations such as Connected Farms to provide the underserved within the agriculture sector with connectivity services.

Connected Farms encourages the ACMA to review the technical assumptions and subsequent planning criteria in RALIs MS33 and MS34 as a key part of any planning outcome. Antenna technology and the possibility to dynamically adjust coverage area may mean the current notional 15km cell radius RALI deployment model is too 'rigid'. Review of MS33 and MS34 spectrum planning criteria and protection ratios in the context of technology advancement, would subsequently allow system designers and Accredited Persons to work with a wider range of possible spectrum utilisation and coverage area outcomes. Within the context of reducing the 45km 'no reuse' radius, development of planning criteria may allow for more dynamic planning of notional coverage areas larger or smaller than the current 15km.

