



**Submission to the Australian Federal Parliament's House of Representatives
Standing Committee on Communications and the Arts: Inquiry into 5G mobile telephony**

This submission by ORSAA¹ addresses the deployment, adoption and application of 5G technologies in Australia. It specifically refers to the committee's terms of reference: Investigate the capability, capacity and deployment of 5G. ORSAA has identified the following serious issues in relation to the proposed deployment of 5G in Australia:

Harm to human health and likely wider harm to the environment, as well as alterations of atmospheric physical and ecological systems.

At the turn of the century the Australian Senate conducted an inquiry into the health effects of electromagnetic radiation (Commonwealth of Australia, 2001) when the scientific evidence for harm was uncertain. Since then, the evidence for harm has become clearer, so that parliaments across the world have been calling for precaution due to the serious risks (e.g., European Parliamentary Assembly, 2011). These risks are described in more detail below.

Environmental Health Risks

When addressing the risks, the exposure agent associated with 5G must be considered; i.e., Radio Frequency (RF) radiation which is part of the electromagnetic (EMR) spectrum that uses man made, continuous, pulsed and modulated signals based on frequencies from long AM radio waves through to millimetre length microwaves (just below infra-red and visible light). The prevalence of this agent (RF-EMR) in our environment has increased enormously in recent decades with toxic effects demonstrated for living organisms and serious possible harm posed for environmental systems. Furthermore, energy requirements are estimated to increase by at least a factor of three. With Australia's existing energy supply problems being unknown, it is unclear how we will be able to cope with this demand.

Risk with respect to cancer

The entire RF-EMR spectrum (including AM/FM range radio waves, and microwaves) was classified by the WHO's International Agency for Research on Cancer (IARC) as a Group 2B Possible Carcinogen in 2011 (International Agency for Research on Cancer, 2011). The US National Toxicology Program has recently provided clear evidence of carcinogenicity and DNA damage associated with exposure to RF-EMR (National Toxicology Program, 2018; Smith-Roe et al., 2019). This new evidence strengthens thousands of scientific studies that have been conducted over the decades which show adverse biological/health effects of RF-EMR (e.g., EMF-Portal, 2019; Markov, 2018; ORSAA, 2019). The IARC (2019) has recently announced that RF-EMR needs to be re-evaluated with high priority. According to the latest findings by the World Cancer Research Fund (2018) Australia now has the world's highest incidence rate of cancer.

¹ The Oceania Radiofrequency Scientific Advisory Association (ORSAA) is the only independent scientific organization in the Australia-New Zealand region investigating the health risks of low-intensity radiofrequency electromagnetic radiation (RF-EMR), mostly microwave range RF-EMR generated for wireless communications and surveillance. Within a few years of inception, ORSAA has established the world's largest freely available categorised database of peer-reviewed scientific research on RF-EMR biological/health effects: www.orsaa.org. This database is intended to facilitate an evidence-based approach to risk assessment of wireless technologies. The ORSAA database currently contains over 3000 scientific studies sourced from all over the world. ORSAA is not funded by commercial entities and therefore without any financial conflicts of interests.

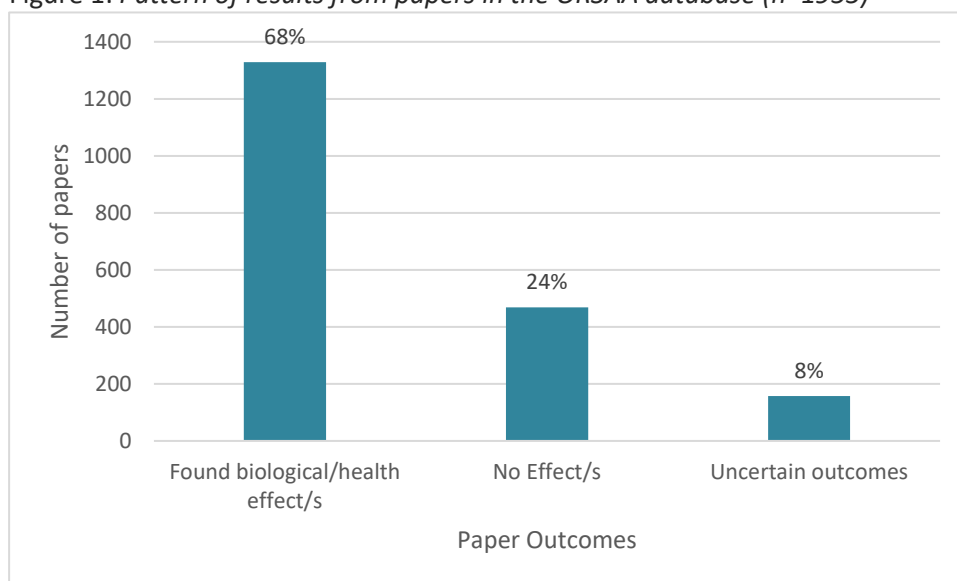
Risk of other adverse health effects

The broad categories of RF-EMR effects found in the scientific literature are compiled within the ORSAA database (www.orsaa.org). The papers in these categories reveal the following major health risks:

- neurodevelopmental disorders in children
- neurodegenerative diseases in adults such as dementia, multiple sclerosis, Parkinson's disease
- neuropsychiatric/neurobehavioural problems including memory problems, anxiety, depression, insomnia and resulting fatigue
- lowered fertility and serious damaging effects on reproductive tissue and sperm
- immune diseases/disorders such as allergies, atopic dermatitis and autoimmune diseases
- metabolic diseases arising out of sustained disruption to basic cellular functions such as mitochondrial dysfunction.

A cross sectional study of 1,955 scientific experimental studies within the ORSAA database (laboratory studies and population-based studies examining biological and health effects of RF-EMR exposures) revealed that the majority of papers (68%) show significant biological or health effects, as summarized in Figure 1 below. Notable are the large numbers of papers showing harm caused by oxidative stress, a pathological phenomenon which is involved in many chronic diseases such as cancer, heart disease, diabetes and which underlies mental illnesses such as depression and Alzheimer's disease. Furthermore, oxidative stress provides a clear mechanism for how existing mobile technologies can cause harm to health, which lays to waste the claims that no scientific mechanism has been found.

Figure 1: Pattern of results from papers in the ORSAA database (n=1955)



This clear weight of evidence refutes the widely-held claim that wireless technologies pose no health risks. Typical RF-EMR exposures experienced by Australians on a daily basis fall within the permitted 'safety' levels as advised by ARPANSA. However, the evidence shows that typical exposures can induce oxidative stress in cells leading to many chronic health conditions in the exposed population. These findings call for an immediate *reduction* in the allowable RF-EMR exposure levels (Bandara & Weller, 2017). Instead, with no heed to the current evidence, the industry is marching on to add 5G frequencies into the mix.

Evidence for health effects from 5G frequencies

While the existing large volume of scientific studies show clear health risks with the frequencies used in the first phase of 5G deployment, very little research has been done so far on the health effects of millimetre waves to be used for the second phase of 5G (6 to 86 GHz). The existing review papers (Oughton, Frias, Russell, Sicker, & Cleevly, 2018; Russell, 2018) reveal the current known effects of these waves:

- 1 Despite shallow penetration (compared to lower frequencies) 5G millimetre waves pose harm to the largest organ of the body, the skin, with the possibility of permanent tissue damage (Neufeld & Kuster, 2018).

- 2 Effects on eyes (including cataracts), heart rate, immune system and DNA have been shown.
- 3 Millimetre waves can also affect important components of skin such as nerves, immune cells, blood vessels causing systemic effects involving internal organs. It has been found that sweat ducts of skin act as helical antennae for millimetre waves.
- 4 Due to the pulses from 5G phased arrays, the moving charges within the body become tiny antennas. They then reradiate waves called 'Brillouin Precursors' deeper into the body (Albanese, Blaschak, Medina, & Penn, 1994), which become dangerous with rapid changes in power or phase of the waves (Xiao & Oughstun, 1999) as will occur with 5G.

Risk of harm to birds, bees and insects

Microwave radiation is already having effects on birds, bees and pollinators (Bandara & Carpenter, 2018; Lázaro et al., 2016; Warnke, 2009). Moreover, insects will maximally absorb 5G radiation due to the length of their bodies being measured in millimetres and the subsequent resonance effects (Thielens et al., 2018). Therefore, 5G radiation could have catastrophic effects on the already endangered insect populations worldwide, which has implications for Australian agriculture and for global food supplies.

Harm to earth's atmosphere

Together, the earth, the ionosphere and the lower atmosphere form a global electric circuit that controls the biological rhythms of humans, birds and animals. These rhythms are essential for life, affecting blood pressure, the sleep-wake cycle, reproductive, cardiac, and neurological systems. To enable 5G, tens of thousands of satellites will be placed in both the ionosphere and magnetosphere, sending signals at millions of watts. When these powerful man-made signals are imposed on the natural background EMFs they are likely to alter the electromagnetic environment significantly, and may be very damaging to all life on earth (Firstenberg, 2018). In addition, the engineering literature is clear that the high frequency waves proposed for stage 2 of 5G communications will create quantum level changes in the rotational energy of water (at 22.3GHz, 33GHz, 323 GHz) and oxygen molecules (at 60 GHz). Given these molecules are the basis of life, the effects of altering the fundamental characteristics of water and oxygen are likely to be inimical to life on earth.

Unsustainable: significant increases in energy burden promoting global warming

While industry expects that each 5G device will use less power, it also expects that there will be millions more connections and devices. The maths therefore predicts that overall, power consumption of 5G will make greater demands on the earth's resources than ever before. The Centre for Energy Efficient Communications White Paper (2015) points out that wireless systems use 15 to 23 times more energy than wired systems, and that up to 90% of this energy is used by wireless network technologies. Furthermore, according to Zhengmao Li of EVP China Mobile, the challenges of 5G deployment are that 5G needs three times the number of base stations for the same coverage as LTE, and furthermore the power consumption of one 5G base station is three times the power consumption of 4G LTE (Jones, 2019). A recent online report which surveyed more than 100 telecommunications decision makers (Vertiv, 2019) found that 5G technology will likely increase total network energy consumption by 150 to 170 per cent by 2026.

... 5G is going to be significantly more energy-intensive than previous generations of wireless connectivity .. extra efficiency measures will need to be taken to ensure a worthwhile investment..

(see Maisch (2019) for a full summary of this report).

With humankind facing a global warming and global energy crisis, the move to expand energy consumption for more unnecessary technology is both reckless and irresponsible.

The deployment of 5G is not financially secure

The engineering literature on 5G raises concerns about the ability of industry to finance 5G deployments and infrastructure. As well as the increased costs of energy consumption, 5G base stations cost four times the price of LTE (Jones, 2019). It appears that the push to encourage 5G cities and the driverless car industry is a strategy by industry to bring countries on board in order to cover the costs of 5G deployment:

...small cell deployments provide significant capacity but at considerable cost, and hence are likely only in the densest locations, unless MNOs can boost revenues by capturing value from the Internet

of Things (IoT), Smart Cities or other technological developments dependent on digital connectivity.
(Oughton et al., 2018 p.1.)

This issue has also been raised by the ex-CEO of Internet Australia (Patton, 2019).

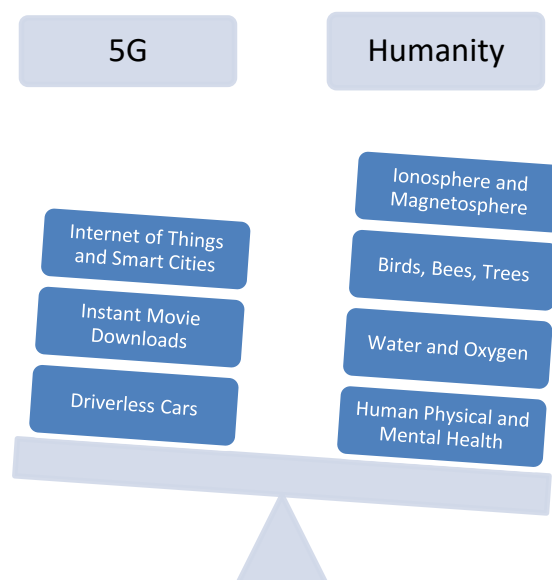
Summary and Recommendations

ORSAA's major concern is the evident harm to the mental and physical health of the current and next generations, as well as the likely harm that is forecast by experienced scientists in this field for our planetary stability and ecosystems.

Given the high risks involved, there is an urgent responsibility to the public for the Australian government to disallow further increases in the population's exposure to RF-EMR with the proposed 5G technologies. Scientists at ORSAA therefore recommend that:

- The Australian government immediately halt the 5G deployment due to the serious risk to public health and planetary health.
- Australia adopt the **ALARA (As Low As Reasonably Achievable)** principle with respect to RF-EMR exposure and **Prudent Avoidance** of RF-EMR exposure in children and pregnant women in order to protect vulnerable children and fetuses.
- Safer alternatives available such as fibre and cable be used and regulations put in place to enforce such safe technologies in all educational settings, hospitals and all public places
- Australian citizens be given the right to refuse exposures to EMF-RF in their home, at work or the marketplace.
- The Australian government establish an organisation to monitor and advise on EMF exposures, that is independent of industry and comprised of suitable expertise in biophysics, medical research and with knowledge of the effects of EMRs on neuropsychology and neuropsychiatry. Engineers and physicists are not qualified to make informed decisions about health effects.

In the balance we have the needs of industry to promote its own growth and development and the push to 'innovate' versus the serious risks to humans and the planet. We implore the committee to consider what is in the balance, and the responsibility of the government to protect its people and the environment. RF-EMR is a biologically damaging agent akin to ionizing radiation and non-ionizing UV radiation. It is not possible that RF-EMR will ever be 'proven' safe but substantial evidence of harm is already here. What is required now is the political will to address the scientific evidence in a prudent manner with public health protection a prime mainstay instead of economic interests. An unhealthy population would significantly impact Australia's economy and social structure.



ORSAA offers our cooperation and assistance with this review process and look forward to hearing from the committee concerning any or all of the above issues that we have raised.

Yours sincerely,

ORSAA

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