CHAPTER 4

AUSTRALIAN STANDARD ON RADIOFREQUENCY FIELDS EXPOSURE LEVELS

Introduction

4.1 Uncertainty about potential of low intensity, long-term exposure to RF from telecommunications technology was found by the Committee to be the basis of the continuing argument for a sensible precautionary approach (principle). With the inadequate research data currently available, it has not been possible to estimate or quantify with any degree of accuracy the extent of a safety margin that needs to be prescribed in standards to be properly protective of the risk to the public.

4.2 Central to the question of the adequacy of our standards was whether or not they dealt with non-thermal emissions which have been shown by a growing body of research to show biological effects. Dr Michael Repacholi of the World Health Organization explained that the scientific studies on which our standards are set were observations of behavioural change in primates exposed to heat emitting devices. The Committee Chair found the progress of standard development to have been somewhat arbitrary and inadequate in dealing with non-thermal effects.

4.3 The Committee stresses in Chapters 3 and 4, the necessity for research to be carried out into the mechanisms of interaction of telecommunications frequency microwaves with biological tissue. This research must operate independently of influence by industry, government or regulatory bodies. Without basic science data the Committee found that it is not possible for anyone to predict what adverse health outcomes might occur.

Development of the standard

4.4 The Australian Standard, first published in 1985, deals with human exposure to radiofrequency fields. It was developed and subsequently revised by a technical committee of Standards Australia. The technical committee did not reach agreement on the last revision of the Standard in 1999, which sought to introduce the more lenient ICNIRP Guidelines, and the responsibility for setting a new standard was transferred by the Government to the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) which will formally adopt the Standard as an ARPANSA standard and incorporate it into its regulations once it is accepted by the ARPANSA Radiation Health Committee.

4.5 In the meantime, both ARPANSA and the Australian Communications Authority have legislative instruments in place to limit human exposure to radiofrequency fields. These instruments (Radiocommunications (Electromagnetic Radiation — Human Exposure) Standard 1999 and Australian Radiation Protection

and Nuclear Safety Regulations) are based on the limits previously contained in the interim 1998 standard (AS/NZS 2772.1(Int):1998). These limits represent a weakening of protection for both occupational and public exposure.

Basis of Radiofrequency Standards

4.6 Radiofrequency signals were first used in 1895 and by the early 1920s broadcasting was becoming commonplace. At this time, research was beginning to probe the potential for biological effects of radio waves, effects on the nervous system, and other observations of harm such as localised burns and electric shocks caused by direct contact with a conductor.

4.7 During and after the Second World War, the effects of exposure to radiofrequency radiation became a matter of intense study particularly in the then Soviet Union. Over time, military applications became more powerful and the frequency range used grew. As higher power uses of radiofrequency developed, its ability to cause serious burns became evident. The US Military devised criteria based on tolerable thermal loadings

4.8 According to Dr David Black, a medical practitioner, specialist in the health effects of radiofrequency radiation, and telecommunications industry consultant, in the early 20th century there had not been the same concern about radiofrequency radiation as there had been about ionising radiation, and it took longer for controls to be put in place:

> Right up until the Second World War, people accepted that RF could cause burns and electric shocks at high levels, but it was not really until after the Second World War and the 1950s that people started thinking that standards were needed to control these fairly obvious, and what are known as, direct effects. Standards were developed originally on a bit of a rule of thumb by just taking power flux density levels which seemed to be safe just based on anecdotal experience at the time. Those formed the first standards back in the 1950s.[1]

4.9 The intensity, (or power density), of electromagnetic fields can be expressed in terms of a unit of power relative to area (eg watts per square metre - W/m^2 or milliwatts per square centimetre - mW/cm^2)[2]. It was recognised that experimental animals died quickly at exposures of 100 milliwatts per square centimetre (100 mW/cm^2) and that the primary mechanism for injury was related to excess heating resulting from the absorption of the microwave energy in various tissues within the body.

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1 *Official Committee Hansard*, Canberra, 8 September 2000, p 56.

2 A watt is an electrical unit of power.

1 watt (1 W) = 1 000 milliwatts (1 000 mW) = 1 000 000 microwatts (1 000 000 μW)

1 W/m^2 = 0.1 mW/cm^2 = 100 $\mu W/cm^2$

4.10 In 1953, the US Navy adopted a maximum continuous exposure limit of 10 milliwatts per square centimetre (10 mW/cm^2) for all radiofrequency and microwave frequencies in use. This limit avoided burns and was a tenth of the level where short term fatal effects had been observed in experimental animals. The level is equivalent to 10,000 microwatts per square centimetre (10,000 $\mu W/cm^2$). This exposure level was later accepted by the entire US military and, in 1966, by the American National Standards Institute (ANSI).

4.11 The concept of safety in these early military and later ANSI standards was very basic and the concepts of dose that are used today are still based on thermal or heating effects and the SAR concept of dosimetry that is applied is flawed.

4.12 According to the ARPANSA draft standard,[3] early exposure standards were inadequate because they failed to account for important physical aspects of electromagnetic wave interaction with the body. In addition to the magnitude of the applied fields, absorption of radiofrequency energy depends on the physical geometry of the body relative to the direction of the applied fields and also upon frequency dependent electrical properties of the absorbing tissue. In particular, the body, or parts of it, can act like a tuned antenna with specific radiofrequency bands. This concept still fails to take into account more subtle interactions with biological systems that have nothing to do with the effects of absorbed energy being turned into heat.

4.13 The most damaging frequencies according to the SAR dosimetry model are those at resonance range of the human body which occurs at frequencies between about 30 megahertz (30 MHz) and 300 megahertz (300 MHz). This means that electromagnetic fields in this frequency range approach or coincide with the natural frequencies in the human body. This maximises their penetration of tissue and the absorption of energy in the body. The precise resonant frequency varies with individuals depending on their size and their orientation in relation to the field. An average man in free space has a resonant frequency of about 66 MHz. For taller individuals, the resonant frequency is somewhat lower, and for shorter adults, children, babies and seated individuals, it may exceed 100 MHz.[4]

4.14 Dr John Holt, Medical Clinician and Director of the Microwave Therapy Centre in Perth, pointed out in his evidence that cancer is electrically conductive, and that cancer, when exposed to 434 MHz, will resonate and fluoresce. Dr Holt informed the Committee that Professor Joines of the US discovered that at 180, 200 and 300 MHz cancerous tissue was six times more conductive than normal tissue.

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3 ARPANSA Radiation Protection Standard, Maximum exposure levels to radiofrequency fields — 3kHz to 300GHz, Draft for public comment, Schedule 1, Rationale, p 27.

4 ARPANSA Radiation Protection Standard, Maximum exposure levels to radiofrequency fields — 3kHz to 300GHz, Draft for public comment, Schedule 1, Rationale, pp 27 and 37; Annex 2, Coupling mechanisms between fields and the body, p 59, and CSIRO Australia, Status of research on biological effects and safety of electromagnetic radiation: Telecommunications frequencies, June 1994, p 126.

4.15 Biological responses from exposure to radiofrequency fields do not merely depend on the intensity of the fields outside the body, but on the subtle effects of the electromagnetic energy on the blood forming immune, nervous and endocrine systems inside the body. Exposure to a uniform electromagnetic field results in a highly non-uniform deposition and distribution of energy within the body. Research has shown that electromagnetic fields can be divided into four ranges, as regards absorption of energy by the human body[5] which illustrates the inadequacy of the SAR dosimetry system. It is currently assumed that different frequencies have different bioeffects because of the heating effects they cause. These frequency ranges and effects are:

- from about 100 kilohertz (100 kHz) to less than about 20 megahertz (20 MHz) (sub-resonance range), at which absorption in the trunk decreases rapidly with decreasing frequency, and significant absorption may occur in the neck and legs;
- frequencies in the range from about 20 MHz to 300 MHz (the resonant range), at which relatively high absorption can occur in the whole body, and even higher values if partial body (eg head) resonances are considered;
- frequencies in the range from about 300 MHz to several gigahertz (GHz), (hot spot range) at which significant local, non-uniform absorption occurs. The size of these 'hot spots' decreases from several centimetres to about 1 cm as the frequency increases; and
- frequencies above about 10 GHz (surface absorption range), at which energy absorption occurs primarily at the body surface.

Specific Absorption Rate (SAR)

4.16 During the 1950s, a dosimetric approach was being developed for chemical safety and nuclear safety. Dosimetry is the science of measuring exposure to an agent - whether that be a chemical or an amount of radiation. This approach was extended to non-ionising radiation research and resulted in the development of the concept of specific absorption rate (SAR), which defines the amount of power absorbed per body mass. It is measured in watts per kilogram (W/kg) and is the basis of high frequency standards today. The SAR is the rate of absorption of radiofrequency energy in a unit mass of tissue. It represents the energy actually absorbed and as such is one indicator of the effect of the dose of radiofrequency energy.

4.17 In the SAR system, the total amount, the distribution, and the rate of absorption of electromagnetic energy in a living system are the function of many factors. The quantities of energy, internal electrical field strength, induced body current, induced current density, and specific absorption rate are all interrelated. The

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5 ARPANSA Radiation Protection Standard, Maximum exposure levels to radiofrequency fields — 3kHz to 300GHz, Draft for public comment, Annex 2, Coupling Mechanisms between fields and the body, pp 58 and 59; CSIRO Australia, Status of research on biological effects and safety of electromagnetic radiation: Telecommunications frequencies, June 1994, p 126.

SAR is commonly used for comparisons of biological effects under different exposure conditions. It can be used to determine the internal (absorbed) energy distribution.[6]

4.18 There are problems with access to measurement with the SAR system. The SAR cannot be readily measured in routine exposure assessment, but requires special techniques to determine it, either in the laboratory or with computer estimations. It was not until the development of reasonably powerful computers and other technologies (such as high sensitivity thermal imaging cameras) in the mid 1970s, that significant advances could be made in the radiofrequency dosimetry area.[7] When the SAR is not known, characteristics of the radiofrequency field (eg power density, electric field strength, magnetic field strength, polarisation) are used to estimate exposure. These measurements are more readily available to people and give a reasonable and more practical idea of whether or not the levels present are hazardous.

4.19 In tissue, the specific absorption rate depends on the internal electric field strength. Average SAR and SAR distribution can be computed or estimated from laboratory measurements. Values of SAR depend on the following factors:

- the electromagnetic field parameters, ie, the frequency, intensity, polarisation and distance of the source from body it intercepts;
- the characteristics of the exposed body, ie, its size and internal and external geometry, and the non-conducting (dielectric) properties of the various tissues; and
- ground effects and reflector effects of other objects in the field near the exposed body.[8]

4.20 Work on specific absorption rate had settled on 4 watts per kilogram (4 W/kg) as a level of exposure which could result in an experimental rise in core body temperature of up to 1°C. A rise in core body temperature of more than 1°C is not well tolerated by the body and produces deleterious effects. Thermal Standards are based only on the relatively basic idea of preventing core body temperature increases and aim to keep exposures to radiofrequency fields below these levels. A factor of 10 was incorporated into where thermal effects were observed and this is the basis of the original benchmark of 0.4 watts per kilogram in the standards today.[9] The body is made up of very different tissue types and the absorption varies giving quite

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6 AS/NZS 2772.1(Int):1998, Interim Australian/New Zealand Standard, Radiofrequency fields, Part 1: Maximum exposure levels—3 kHz to 300 GHz, Standards Australia/Standards New Zealand, Appendix A, p 23.

7 ARPANSA Radiation Protection Standard, Maximum exposure levels to radiofrequency fields — 3kHz to 300GHz, Draft for public comment, Schedule 1, Rationale, p 26.

8 ARPANSA Radiation Protection Standard, Maximum exposure levels to radiofrequency fields — 3kHz to 300GHz, Draft for public comment, Annex 2, Coupling mechanisms between fields and the body, p 59.

9 Australian Parliamentary Library, Current Issues Brief No. 26, 1996-97, Rod Panter, Science and Technology Group, 19 June 1998.

unpredictable internal temperature increases so the measurement system leaves a considerable margin of uncertainty about what is really going on inside a human body exposed to radiofrequency radiation.

4.21 Given therefore the complexity and variability of the resonant properties of the human body, the Committee Chair questions the efficacy of artificial modelling as an adequate tool to define safety levels in wireless equipment.

Standards Australia International Limited

4.22 Standards Australia International Limited (Standards Australia) is recognised as Australia's peak national standards body through a Memorandum of Understanding with the Commonwealth Government. It was founded as an association in 1922 under the name of Australian Commonwealth Engineering Standards Association, but was changed to Standards Association of Australia in 1929. In 1950, the Association was constituted as a body corporate and politic, by way of a Royal Charter, and in 1988, the trading name Standards Australia was adopted. In 1999, it became an independent company and adopted the name Standards Australia International Limited.

4.23 Standards Australia prepares and publishes most of the voluntary technical standards used in Australia. These standards are developed through an open process of consultation and consensus, in which all interested parties are invited to participate. According to Mr Colin Blair from Standards Australia:

> … Standards Australia is a facilitator of a process for the development of standards which brings together experts from representative interest groups that work to formulate or revise standards. Standards Australia is a facilitator. We do not play an active part in the decisions of the committee, we do not have a vote on any standards that are prepared and we do not chair meetings.[10]

4.24 Although standards developed by Standards Australia are voluntary, they do become mandatory when referred to in legislation. This has occurred with the radio-frequency fields exposure standards.

Standards Australia Technical Committee TE/7

4.25 To formulate standards, Standards Australia convenes a technical committee representative of relevant stakeholders, by securing the participation of those interested parties concerned with a particular project. The majority of individuals who serve on technical committees are representatives of sectors of interest nominated by government bodies, industry associations, community-based and consumer organisations, trade unions and professional, technical or trade associations. Such

10 *Official Committee Hansard*, Sydney, 16 November 2000, p 281.

technical committees should operate under internationally accepted principles of transparency and consensus.

4.26 Standards Australia informed the Senate Committee that when nominees of organisations are appointed as committee members, it is their duty to ensure that their nominating organisations are kept informed of committee activities. Committee members are required to represent the views of their nominating organisations at the technical committee meetings, not personal or company views. Individuals, however, do not represent their employers, but they do represent the sectional interests of their employers. It is accepted that they will use the resources of their particular organisations to assist in the preparation of the most appropriate Standards.[11]

4.27 The Standards Australia technical committee responsible for considering standards for human exposure to electromagnetic radiation is the TE/7 Committee. It was established in 1984 and has been a joint Australian/New Zealand committee since 1992.

4.28 Four standards have been published as an outcome of TE/7 deliberations:

- AS 2772.1:1985 Radio frequency radiation - Part 1: Maximum exposure levels - 300 kHz to 300 GHz;
- AS2772.1:1990 Radiofrequency Radiation - Part 1: Maximum Exposure Levels - 100 kHz to 300 GHz;
- AS/NZS 2772.1(Int):1998 Radiofrequency fields - Part 1: Maximum exposure levels - 3 kHz to 300 GHz (commenced in March 1998 but was withdrawn by TE/7 vote, effective from 1 May 1999); and
- NZS 2772:Part 1:1999 Radiofrequency fields - Part 1: Maximum exposure levels - 3kHz to 300 GHz (effective from 1 May 1999 - New Zealand only).[12]

4.29 Because of the level of public concern about proposals to weaken the principles of radiation protection and increase the amount of radiation that Australians can be exposed to, no agreement was reached and so the increases were partly introduced by stealth when AS/NZS 2772.1(Int):1998 was issued as an Interim Standard before being finalised to allow further committee review and public comment. The subsequent public disquiet however, ended with the interim standard being withdrawn with effect from 1 May 1999 (see below).

Standards Australia Processes

4.30 Mr Blair, from Standards Australia, informed the Committee that the process of developing standards has three main components:

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11 Standards Australia International Limited, Submission 133, Attachment 6, *Preparing Standards, Standardization Guide No. 1*, Standards Australia, Standards New Zealand, March 1996, p 3.

12 Standards Australia International Limited, Submission 133, p 1.

> The first component is that it is an open and transparent process. The second component is that we have a balanced representation on our committees. This balance is a cross-section of all organisations that would potentially be used or influenced by the standard. Generally, when we look at that balance, we split it into groups along the lines of user, purchasing bodies, manufacturers-suppliers, independent professional and technical bodies, consumers, regulatory or controlling bodies, research and testing organisations and unions. The third component of our process is consensus. Really, the important part of the consensus process is when the formal postal ballot takes place after the document has been developed and been through the public comment stage.[13]

4.31 In order for a Standard to be published, there are three conditions that need to be met:

- 67 per cent of people who are eligible to vote, do actually vote on the document;
- of those who have voted, 80 per cent must be supportive of the document; and
- even if the 80 per cent positive vote is achieved, no major sectoral interest is to maintain a negative vote.[14]

4.32 Standards Australia argued that, through an open and transparent process, balanced representation on the committees and the consensus requirements, fair and reasonable documents are published at the end of the day. If consensus is not reached, the documents are not published.

History of the Australian Standard

4.33 Following the US military, a limit of 10,000 microwatts per square centimetre (10,000 $\mu W/cm^2$) had been informally adopted in Australia through various guidelines and rules imposed by most radiation generating authorities between 1955 and 1979, but there was no Australian Standard as such until 1985.

Australian Standard AS 2772: 1985, Maximum Exposure Levels - Radio-Frequency Radiation - 300 kHz to 300 GHz

4.34 In formulating AS 2772: 1985, the Standards Association of Australia technical committee (TE/7) reviewed but found inadequate an American National Standards Institute (ANSI) proposal for exposure limits in the frequency range 300 kilohertz (300 kHz) to 100 gigahertz (100 GHz).

4.35 The 1985 Australian Standard took a conservative approach to setting exposure levels. It differed from the maximum exposure levels proposed by ANSI by choosing lower exposure levels for the higher and lower frequency ranges; and an

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13 *Official Committee Hansard*, Sydney, 16 November 2000, p 281.

14 *Official Committee Hansard*, Sydney, 16 November 2000, p 282 [Blair].

averaging time of one minute was adopted for all exposure conditions, regardless of the field strength, rather than the six minute averaging time suggested by ANSI. It also contained reference to the ALARA Principle whereby all doses should be kept as low as reasonably achievable, economic and social considerations being taken into account.

4.36 Another useful feature of the 1985 Australian standard was to establish reduced exposure limits for the general population than for the occupationally exposed population. This is because the occupationally exposed population consists of adults who are exposed under controlled conditions, and who are supposed to be trained to be aware of potential risks and to take appropriate precautions. The duration of occupational exposure is limited to the length of the working day or duty shift per 24 hours, and the duration of the working lifetime.[15]

4.37 The general public (the non-occupationally exposed population) comprises individuals of all ages and different health status. The resonant range is different for adults and children and so is the distribution of radiofrequency energy absorption in various body parts. Some individuals may be particularly susceptible to radiofrequency radiation. In addition, members of the public are not always aware that exposure takes place and they can be exposed 24 hours per day, and over their entire lifetime. They cannot reasonably be expected to take precautions against radiofrequency and particularly burns and shocks. For these reasons lower basic (and derived) exposure levels are adopted for the non-occupational population than for the occupationally exposed population.[16]

4.38 The limits set out in the 1985 Standard are specified in basic restrictions which affected industries argued were difficult and, in many cases, impractical to measure

4.39 Dr Repacholi, suggested that the exposure levels in the Australian standard for the microwave region of the spectrum were set at levels which owed more to negotiations between the various parties than to the scientific evidence:

> I was involved in the early attempts to develop an Australian standard. The standard was developed primarily on the international standard at the time and follows the international standard except in one region, called the microwave region. There was so much discontent about this that the level ended up being a negotiated level. It was not based on the science. Everything was based on the science up to that point, but the last part was not based on the science - it was negotiated between the unions and the government at the time.[17]

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15 Interim Australian/New Zealand Standard, Radiofrequency fields, Part 1: Maximum exposure levels - 3kHz to 300 GHz, Standards Australia/Standards New Zealand, p 22.

16 Interim Australian/New Zealand Standard, Radiofrequency fields, Part 1: Maximum exposure levels - 3kHz to 300 GHz, Standards Australia/Standards New Zealand, p 22.

17 *Official Committee Hansard,* Canberra, 31 August 2000, p 8.

4.40 According to Mr Alexander Doull, a member of the TE/7 Committee, the 1985 Australian Standard tightened and reduced the then allowable exposure limits and incorporated explicit, fundamental principles of radiation safety. It also explicitly acknowledged:

- the limitations of a standard based only on preventing heating and burns; and
- a possibility of harmful non-thermal effects on living systems.[18]

4.41 The CSIRO informed the Committee that in recent years there have been various attempts to relax the acceptable limits of radiofrequency exposure in the Australian Standard. The rationale has been to align it with international guidelines although, according to the CSIRO, there is no substantial new scientific evidence on which to base such a proposed change.[19]

4.42 Mr Doull suggested that since 1985, the Australian Standard has come under sustained industry pressure to revert to much higher levels of exposure to radiofrequency radiation; to completely delete any references to fundamental principles of radiation safety; to minimise any explicit references to harmful effects; and to delete the previous acknowledgment of the existence of non-thermal effects on living organisms.[20] He believes that the changes in the official Standard that the industry has wanted would probably have the effect of protecting the industry from future litigation. Mr Doull referred to a precedent setting case of fatal microwave disease in New York which had been the first jurisdiction to recognise asbestos diseases in exposed workers.

4.43 In response to earlier questioning by the Committee about the issue of litigation, Dr Hugh Bradlow from Telstra, replied:

> I presume we have adequate liability coverage and, given that there is no identified effect, it is very hard to take out insurance against something that does not exist.[21]

4.44 The 1985 Standard had excluded devices which operated below 1 GHz and had a power output of below 7 watts from compliance with the Standard. It was decided that it would be unlikely that these devices could couple enough energy into any size human body such that the average whole body SAR of 0.4 W/kg would be exceeded. In addition, it would not be expected that there could be any spatial peak SAR in the human body exceeding 8 W/kg averaged over any one gram of tissue this

18 Mr Alexander Doull, Submission 113, p 1.

19 CSIRO Australia, Telecommunications & Industrial Physics, Submission 95, p 8.

20 Mr Alexander Doull, Submission 113, p 1.

21 *Proof Committee Hansard*, Canberra, 2 March 2001, p 387.

value being lower than spatial peak SAR which could arise when whole body exposure occurs at the maximum exposure levels.[22]

4.45 In 1988, the Standard was renamed Australian Standard 2772 - 1985 Radio Frequency Radiation Part 1 - Maximum Exposure Levels - 300 kHz to 300 GHz.[23]

AS2772.1-1990: Radiofrequency Radiation Part 1: Maximum Exposure Levels - 100 kHz to 300 GHz

4.46 The 1990 Standard superseded the 1985 standard and introduced changes which included extension of the frequency range down to 100 kHz, and included limits for body-to-ground radiofrequency currents. However, the limits for exposure to radiated fields for both occupational and non-occupational exposure remained unchanged.[24]

4.47 AS2772.1:1990 provided a 'deemed to comply' provision for all radiocommunications transmitters like mobile phones operating below the frequency 1 GHz. If the output power of the transmitter was less than 7 watts, the device was deemed to comply with the Standard. Concern was expressed that, because of the proximity of the radiating antenna to the head, mobile phones on the market were exceeding the exposure limits of the Standard for the general public despite being deemed compliant.[25]

4.48 In 1994, Amendment 1 introduced various corrections and changes, in particular, more explicit requirements for exposure limits for users of transmitters, including hand-held and mobile transmitters.[26] It also lowered the deemed to comply threshold for hand-held digital mobile phones to 0.7 watts and introduced a requirement to label devices.[27]

AS/NZS 2772.1(Int):1998 Interim Australian/New Zealand Standard, Radiofrequency fields Part 1: Maximum exposure levels - 3 kHz to 300 GHz

4.49 A periodic review on the 1990 Standard was begun in 1993 but agreement was not reached as the proposals put forward by industry were to significantly increase allowable exposure limits. It was therefore released as an Interim Standard, AS/NZS 2772.1(Int):1998, while being further considered.

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22 Standards Association of Australia, Australian Standard 2772 - 1985, Maximum Exposure Levels - Radio-Frequency Radiation - 300 kHz to 300 GHz, Appendix A, Rationale for the development of the maximum exposure levels for radio-frequency radiation, p 14.

23 CSIRO Australia, Telecommunications & Industrial Physics, Submission 95, p 9.

24 CSIRO Australia, Telecommunications & Industrial Physics, Submission 95, p 9.

25 Australian Communications Authority, Submission 100, p 6.

26 CSIRO Australia, Telecommunications & Industrial Physics, Submission 95, p 9.

27 Australian Communications Authority, Submission 100, p 6.

4.50 The Interim Standard was based on the International Radiation Protection Association (IRPA) Specific Absorption Rate (SAR) Guidelines, but covered an extended frequency range down to 3 kilohertz (kHz). The basic limits (whole body average SARs) between the Interim Standard and its predecessor standards did not change - occupational exposure limits to radiofrequency fields were based on 0.4 watts per kilogram (0.4 W/kg) and the non-occupational exposure limits were derived from values one-fifth (or less) those of the occupational limits (that is 0.08 W/kg).

4.51 However, there were changes in the derived exposure levels in the frequency range around 1 megahertz (1 MHz) to bring the Interim Standard into line with the recommendations of privately controlled international bodies. On the other hand, the derived exposure levels in relation to frequencies between 400 MHz and 2 GHz were set lower than other International Standards, in accordance with the precedent set in the 1985 Standard. Evidence suggested that the IRPA/ICNIRP methodology would lead to progressively rising derived levels and thereafter to a level which is constant with frequency between 400 MHz and 2 GHz. The TE/7 Committee did not support this approach.

4.52 The Chairman of TE/7 Committee, Dr Repacholi, proposed to use, as the basis for the Australian Standard, the World Health Organisation review of scientific literature which he had edited for the WHO. This WHO publication recommended the international guidelines on exposure limits published by the International Radiation Protection Association (IRPA 1988).

4.53 The Interim Standard was criticised by those concerned with the public interest because the limits were to be relaxed, and the peak exposures diluted by the use of the six minute averaging time rather than the 1 minute averaging time in the 1985 standard. The non-uniform exposure levels were also criticised.

4.54 One of the major objections to the standards was that they only take account of thermal effects of exposure to radiofrequency radiation, and not to non-thermal effects. The Electromagnetic Radiation Alliance of Australia states that:

> The existing standard is based on the erroneous presumption that adverse health effects occur only if the body is heated by 1°C.
>
> There is ample evidence that adverse effects occur at much lower, or athermal, levels that do not require heating of the body.[28]

4.55 Dr John Moulder, Director of Radiation Biology at the Medical College of Wisconsin, USA, emphasised how difficult it is to separate the thermal effects from any non thermal effects:

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28 Electromagnetic Radiation Alliance of Australia (EMRAA), Submission 80, p 17.

> It is probably absolutely impossible to prove that there is absolutely no heating, but with enough engineering wizardry you could probably establish that there could not be very much heating.[29]

4.56 The Mobile Manufacturers Forum argued that standards-setting bodies do not ignore the non-thermal effects in their deliberations:

> We would like to stress that when these standards bodies review the research they are looking at all the research, not just the established effects but the non-thermal as well as thermal effects …[30]

4.57 Dr David Black informed the Committee that the ICNIRP Guidelines do take athermal effects into account. He cited the example of neuro-stimulation which is the biological effect which, at low frequencies, is the effect that the exposure levels in the Guidelines aim to prevent. Neuro-stimulation can be generally regarded as an athermal effect.[31]

4.58 According to Mr Dan Dwyer from the Communication Electrical Plumbing Union, the use of derived exposure levels can result in an increase in exposures:

> What is disappointing is that all the research since the last standard was introduced appears to be aimed at exploiting the basic restriction (a rise in temperature by 1 degree) to the limit. Thus we have had to consider proposals from the manufacturers/telecoms for complex analysis of absorption rates at higher frequencies, averaging time, pulsed transmissions and even pregnant women. Whilst these studies may be mathematically consistent, it is inconsistent with a precautionary approach.[32]

4.59 Dr Repacholi however, disagreed with the need for any inclusion of precautionary principles and would have it that in Australia we are confused and wandering from the path of science:

> There is a confusion in the Australian standard at the moment. It says that the standard is 0.08, but in fact it is not. The limits that came out were not 0.08. Down here it is about 0.01. If you stick to the basic standard it will not be a relaxation. If you stick to the limits that were identified to get that, then yes, it will seem like a relaxation.[33]
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> It [the standard] partly follows the science in the absorption curve. As you increase the frequency, the absorption changes and, at this point, it departs from the normal absorption curve, which is well known and well established

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29 *Proof Committee Hansard*, Canberra, 2 March 2001, p 319.

30 *Proof Committee Hansard*, Canberra, 2 March 2001, p 361.

31 Dr David Black, Submission 93, p 8.

32 Mr Dan Dwyer, Telecommunications Officers Association Branch, Communication Electrical Plumbing Union, Submission 66, Appendix 3, p 14.

33 *Official Committee Hansard,* Canberra, 31 August 2000, p 10.

> in science. The shape of the standard should follow the normal absorption curve for human beings. The negotiated point is the only point of departure from the science.[34]

4.60 When questioned about the consequences of setting a Standard which departs from his view of the science, Dr Repacholi replied:

> There is no effect on health. It is just that, from my viewpoint, I would like to see something that is science based and take away the subjectivity or the various opinions of people. Health is not negotiable; it should be based on something that is substantiated so that you know what level of protection you are providing to people.[35]

4.61 However the Committee Chair considers that the science is divided and uncertain at best and the mounting evidence of cancer risk associated with electromagnetic field exposures is of concern to rational people and that it is not responsible to increase human exposures in these circumstances.

4.62 Dr Repacholi advocates that Australia adopt international limits in line with standards world wide. The Committee notes that this campaign has not won universal support but industry groups favour this approach. The Australian Mobile Telecommunications Association (AMTA) said:

> From an industry's point of view, it is more efficient to provide consumers with safe and technologically advanced wireless communication devices if there is an opportunity, as now, to adopt the internationally accepted ICNIRP guidelines.[36]

4.63 However, in its submission, the CSIRO observed that:

> [t]he limits in the 1985 Australian Standard AS2772 were in place for more than 12 years and did not inhibit the introduction of new technologies or the extension of existing technologies.[37]

4.64 Mr Les Dalton provided the Committee with an example of where lower standards actually operate to encourage technological excellence:

> It is the same story with the exposure to magnetic field emissions from computer screens. Sweden was the first to set a standard of 2.5 milligauss for the electrofrequencies which come from the transformer of computers. This maximum was eventually adopted because schools in the United States, among others, insisted that this be their standard, too. The outcome was that they would not accept computers in schools unless their emissions

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34 *Official Committee Hansard,* Canberra, 31 August 2000, p 12.

35 *Official Committee Hansard,* Canberra, 31 August 2000, p 12.

36 Australian Mobile Telecommunications Association (AMTA), Submission 19, p 10.

37 CSIRO Australia, Telecommunications & Industrial Physics, Submission 95, p 3.

> were less than 2.5 milligauss. Eventually, that became the accepted standard. It only took the industry about 12 months to all be below that, because the technology was there to do it. It turned out that IBM had had a patent for five years to enable them to do it but had not done it. So a rigorous standard is always an encouragement for technological excellence.[38]

4.65 Faced with opposition to increased exposures AS/NZS 2772.1(Int):1998 introduced different 'deemed to comply' provisions for handheld and portable transmitters. The new provisions were based not only on output power, but also on the transmitter's duty cycle and the body-antenna separation distance. The result of the new provisions is that mobile phone handsets need testing to demonstrate compliance with the Standard.[39]

International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines

4.66 The international limits to which the World Health Organization refers (above) are the guidelines drafted by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The ICNIRP was established in 1992 as a successor to the International Radiation Protection Association (IRPA/International Non-Ionizing Radiation Committee (INIRC).

4.67 Industry always stresses the independence of the ICNIRP:

> Membership of ICNIRP is restricted to scientists working from an independent academic basis, and the outputs of the committee are always published in a highly respected peer reviewed biophysics journal, Health Physics. As a result of following this process all of the outputs of the ICNIRP committee are themselves subjected to peer review before publication and normal scientific peer review after publication. In my opinion, this approach is particularly satisfactory as it means that this information which is later used to provide the basis for regulatory documents goes through a standard scientific process of rigorous appraisal.[40]

4.68 Dr Ken Joyner, from the Mobile Manufacturers Forum added:

> If you want to look at one standards body that has specifically excluded any industry representatives, there is the ICNIRP body. You cannot be a member of the ICNIRP panel if you are part of industry. They exclude you from that process.[41]

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38 *Official Committee Hansard*, Melbourne, 22 September 2000, p 174.

39 Australian Communications Authority, Submission 100, p 6.

40 Dr David Black, Submission 93, p 7.

41 *Proof Committee Hansard*, Canberra, 2 March 2001, p 370.

4.69 According to industry and government evidence the ICNIRP guidelines on limiting exposure to non-ionising radiation are based on comprehensive expert reviews of published scientific studies, and establish principles of non-ionising radiation protection for formulating international and national research programs. The ICNIRP used the World Health Organization health risk assessments to derive the guidelines.[42] The ICNIRP exposure guidelines for protecting the public from the adverse health effects of exposure to electromagnetic fields have been endorsed by the European Commission and recommended for adoption within the member states of the European Union (EU).

4.70 The ICNIRP guidelines specify basic restrictions on exposure levels to radiofrequency fields. Depending on the frequency, the physical quantities which are used to specify the basic restrictions on exposure to EMF are current density, SAR, and power density.

4.71 Different scientific bases were used in the development of basic exposure restrictions for various frequency ranges in the ICNIRP Guidelines:

- between 1 Hz and 10 MHz, basic restrictions are provided on current density to prevent effects on nervous system functions;
- between 100 kHz and 10 GHz, basic restrictions on SAR are provided to prevent whole-body heat stress and excessive localized tissue heating; in the 100 kHz – 10 MHz range, restrictions are provided on both current density and SAR; and
- between 10 and 300 GHz, basic restrictions are provided on power density to prevent excessive heating in tissue at or near the body surface.[43]

4.72 Reference levels of exposure (a different name for 'derived exposure levels' which were used in the Australian standards) are provided for comparison with measured values of physical quantities. Compliance with all reference levels given in the guidelines ensures compliance with the basic restrictions.

4.73 In setting limits, it was said that ICNIRP/IRPA identified radiofrequency field values above which adverse biological effects could be confirmed by laboratory studies. These values were used as benchmarks. A safety factor of 10 was then incorporated so that workers would not be exposed to more than 1/10th of the benchmark level. For the general public, an additional safety factor of 5 was incorporated into the exposure limits. Therefore the exposure limits for the general public are set at 1/50th of the benchmark level.

4.74 Because of the different ways in which radiofrequency fields affect the human body depending on their frequency, different parameters for field restriction are used

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42 *Official Committee Hansard,* Canberra, 31 August 2000, p 13.

43 ICNIRP Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz), p 16.

at various frequencies (refer to paragraph 4.15 above). The ICNIRP Guidelines are said to identify the adverse effect which occurs at the lowest level of exposure for differing frequency ranges and use this effect as a limiting benchmark with an additional safety factor.

4.75 Dr Bradlow, Telstra, claimed that the changes in reference levels (derived exposure levels) have come about because of an improved understanding of the coupling[44] between radiofrequencies and biological systems since 1985.[45] This allows the exposure levels to be more precisely defined at the various frequency ranges.

4.76 The allowable general public exposure limits in the Australian Interim Standard were similar to those in the ICNIRP Guidelines except differences occurred in the higher frequencies where the lower levels in the 1990 standard were retained.

Objections to the ICNIRP Guidelines

4.77 The recommended exposure limits in the ICNIRP Guidelines take into account the fact that the effects of electromagnetic fields on the human body can vary depending on their frequency. One of the CSIRO's objections to the levels in the ICNIRP guidelines was that they increase for exposure to frequencies above 400 MHz. The CSIRO argued that there were economic drivers behind the lifting of the allowable exposure at the higher frequencies which happened, by 'sheer coincidence' to be around Telstra's frequency.[46]

4.78 ARPANSA informed the Committee that the reason for the 'dip' in the ICNIRP exposure levels is that the frequency range between 10 MHz and 400 MHz covers the human body's resonance range where the whole body absorption of electromagnetic fields achieves a maximum value. Above 300 MHz the fields are not so well absorbed by the human body.

4.79 Dr Neil Cherry, a New Zealand scientist and academic, asserted that the ICNIRP Guidelines are not based on a public health assessment of the evidence and they only take into account the thermal effects of RF radiation. He claimed he represented many scientists in Europe in criticising the ICNIRP Guidelines, saying that:

> They decide that there is no evidence of genotoxicity but they do not cite any studies that have been published that do show that RF microwaves damage chromosomes – and that is the classic test of genotoxicity. They do not even cite one study that is available in the literature that says it damages chromosomes. Secondly, when I looked at two of their studies on cancer, they said that two recent studies do not show any significant effects. I have

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44 The association of two circuits or systems in such a way that power may be transferred from one to the other.

45 *Proof Committee Hansard*, Canberra, 2 March 2001, pp 379 and 380.

46 *Official Committee Hansard*, Sydney, 16 November 2000, p 229.

> those studies and they do show significant effects. … [I looked] at other studies, and they similarly misused them or they took the author's conclusion when the data contradicts the author's conclusion.[47]

4.80 Mr Alexander Doull also suggested that exposure limits are set to suit industry products rather than for health reasons. He asserted that the refusal of TE/7 members to support the Interim Standard was a rejection of:

> … the practice of setting numerical safety exposure limits to suit existing industry products and then dressing those limits up by retrospectively applying an inadequate, crude, supposedly 'scientific' rationale for those limits. This practice enables the telecommunications industry to increase limits bringing products like the mobile phone which failed to comply with previous public exposure standards within the boundaries of what can then be presented as responsible, acceptable and legally safe.[48]

4.81 This view was echoed by Dr David Mercer in a paper which he wrote on the radiofrequency standard setting process:

> … the push for harmonisation with ICNIRP was in part stimulated by the development of new RF-producing technological applications not covered by the Australian and New Zealand standard but actually built with the ICNIRP standard in mind. It was also suggested that exposures to these frequencies were pushing standard setters to consider frequencies even less well understood than existing ones.[49]

4.82 Mr Les Dalton concurred when he related how the existing radiofrequency standard was developed:

> We had a CSIRO representative on the standard setting committee. … He argued for a maximum public exposure of 40 microwatts per square centimetre. The industry eventually insisted that it be 100. But then they learned that some broadcasting antennas, and particularly one in Adelaide, were well above that. So what happened was that they made it 200. That is the reason we have 200 microwatts per square centimetre, today, for public exposure. It had little to do with science.[50]

4.83 Of the same view is Mr Don Maisch, EMFacts consultant, who claimed that in one of the ICNIRP epidemiological studies the high exposure group was diluted by the low exposure group and that this diluted the final result.

4.84 The CSIRO does not believe that the Australian Standard should more closely follow the limits proposed in the ICNIRP Guidelines:

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47 *Proof Committee Hansard*, Canberra, 2 March 2001, p 339.

48 Mr Alexander Doull, Submission 113, p 3.

49 Dr David Mercer, Submission 51, Attachment, p 52.

50 *Official Committee Hansard*, Melbourne, 22 September 2000, p 174.

> The ICNIRP limits are based solely on known thermal effects, and expressed as a maximum Specific energy Absorption Rate (SAR) in units of Watts per Kilogram. SAR is a difficult quantity to measure directly, and derived limits in terms of field-strength are often more useful. The field-strength limits derived from the ICNIRP model are direct relaxations of the 1985 Australian limits over much of the frequency range. ICNIRP also proposes that measurements be averaged over six minutes, which for intermittent or pulsed fields is an indirect relaxation of the one-minute averaging time of the 1985 Australian standard.[51]

4.85 In February 2000, Switzerland introduced stricter exposure limits in relation to emissions generated by stationary installations.[52] Although the scope of the Swiss Ordinance is limited (for example, it does not apply to emissions from mobile phones), the allowable exposure limits are many times below those in the ICNIRP Guidelines. For example, for transmission installations for cellular mobile telecommunication networks of more than 6 watts, operating at 900 MHz or 1800 MHz, the limit values for the rms[53] electric field strength, are 4.0 volts per metre (4 V/m) and 6 volts per metre (6 V/m) respectively. These levels are approximately 100 times stricter than the levels recommended in the ICNIRP Guidelines.

Claimed benefits of the ICNIRP Guidelines

4.86 The World Health Organization summarised the benefits in achieving harmonised standards for EMF exposure as follows:

- increases public confidence that governments and scientists agree on health risks;
- reduces debate and fears about EMF;
- ensures that everyone is protected to the same high level; and
- has economic benefits to trade that would result in benefits to health.[54]

4.87 The Mobile Manufacturers Forum (MMF) enumerated the benefits of harmonisation of standards, as it views them, for the Committee:

> First of all, there is an increase in public health agency confidence if there is only one standard and they are all saying the one thing. Consumers also gain confidence from one standard for all consumers—if there is no differentiation. The industry also gains because we can design a product once, we can test a product once and we can make that product available

51 CSIRO Australia, Telecommunications & Industrial Physics, Submission 95, p 8.

52 Ordinance relating to Protection from Non-Ionising Radiation (ONIR) of 23 December 1999 (as of 1 February 2000), 814.710.

53 root mean square

54 World Health Organization, Submission 56, p 3.

> everywhere. The World Trade Organisation agreement requires international acceptance of international standards when developing technical regulations amongst member countries.[55]

4.88 Dr Repacholi provided the example of the radiofrequency standard in the United States. There, exposure levels are higher than the international standard in many areas. The WHO feels that it does not incorporate sufficient safety factors.[56]

4.89 The Australian Mobile Telecommunications Association (AMTA) supports a global standard and believes Australia should adopt the international standard. It told the Committee that if this were done, there would be the following benefits to consumers:

> … products will be manufactured to the one standard and there will be a consistency of information that will be provided that will be important in terms of the SAR information. It will enable the manufacturers to have the economies of start scale that will allow a product to come to the market earlier and cheaper. We believe there are a lot of advantages to the community.[57]

Events culminating in the Interim Australian/New Zealand Standard expiring

4.90 The Interim Standard (AS/NZS2772.1(Int):1998) superseded AS2772.1-1990 Standard, and introduced significant changes to the exposure limits which had remained, till then, at the levels in the 1985 Standard (AS2772-1985). The increase in the public exposure levels allowed by these changes was opposed by the CSIRO and some other organisations. According to the CSIRO, it was because of this opposition that the Standard was published as an Interim Standard, scheduled to expire in March 1999. During the lifetime of the Interim Standard, Standards Australia attempted to persuade the TE/7 Committee to agree to a new standard.[58]

4.91 Between August 1998 and April 1999, the TE/7 Committee reviewed the need for a revised Standard to replace AS/NZS 2772.1(Int):1998. According to the Interim Standards document, the particular areas which the Committee was to review were:

- the treatment of non-thermal effects;
- the appropriateness of proposed radiation levels which are based on current World Health Organization (WHO) recommendations; and

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55 *Proof Committee Hansard*, Canberra, 2 March 2001, p 361.

56 *Official Committee Hansard,* Canberra, 31 August 2000, p 16.

57 *Official Committee Hansard*, Canberra, 8 September 2000, p 38.

58 CSIRO Australia, Telecommunications & Industrial Physics, Submission 95, p 9.

- the proposed measurement methods of time and spatial averaging.[59]

4.92 Before the review began, the constitution of the TE/7 Committee was changed to add three new nominating organisations to the Committee, bringing the size of the Committee to 30 stakeholder representatives. The new nominating organisations were: the Consumers' Federation of Australia (2 seats), the Australian Mobile Telecommunications Association (AMTA) (1 seat) and Cable and Wireless Optus (1 seat).[60] The composition of TE/7 appears below:

Table 4.1

Composition of TE/7 Committee[61]

Nominating Organisation	**No. of Representatives**
Adopt Radiation Controls Inc NZ	1
Australasian Faculty of Occupational Medicine	1
Australasian Radiation Protection Society	1
Australian Communications Authority	1
Australian Council of Trade Unions	2
Australian Electrical and Electronic Manufacturers Association	1
Australian Mobile Telecommunications Association	1
Australian Radiation Laboratory	1
Australian Telecommunications Users Group	1
Broadcast Communications Ltd NZ	1
Standards Committee TE/3 - Chairman	1
Communications, Electrical Plumbing Union	1
Consumers' Federation of Australia	2
CSIRO	1
Department of Communications and the Arts	1
Department of Defence	1
Electricity Supply Association of Australia	1

59 Interim Australian/New Zealand Standard, Radiofrequency fields, Part 1: Maximum exposure levels—3 kHz to 300 GHz, AS/NZS 2772.1(Int):1998, Standards Australia, Standards New Zealand, p. 2.

60 Standards Australia International Limited, Submission 133, p 2.

61 Standards Australia International Limited, Submission 133, Attachment 5.

Institution of Engineers Australia	1
Local Government New Zealand	1
Ministry of Commerce New Zealand	1
National Occupational Health & Safety Commission	1
National Radiation Laboratory New Zealand	1
New Zealand Association of Radio Transmitters	1
The NZ Institute of Occupational & Environmental Medicine	1
Optus Communications	1
Standards Australia	1
Standards New Zealand	1
Telecom New Zealand Limited	1
Telstra Corporation Limited	1
Wireless Institute of Australia	1
Total	**32**

Table 4.2

Committee Balance - Number of committee positions in each of the following groups[62]

Category	Australia	New Zealand	Total
User and Purchasing Bodies	3	1	**4**
Manufacturers/Suppliers	5	2	**7**
Independent Professional and Technical Bodies	4	1	**5**
Unions	3	–	**3**
Consumers	3	1	**4**
Regulatory or Controlling Bodies	3	1	**4**
Research Organisations	2	1	**3**
Standards Organisations*	1	1	**2**
	24	**8**	**32**

* The two members of Standards Australia and Standards New Zealand do not vote on the Standards.

4.93 The TE/7 Committee followed the accepted Standards Australia/Standards New Zealand process in reviewing the Standard which was said to have been done in the light of the most recent developments both in Australia and internationally. Two formal Committee meetings were held on 11/12 August 1998 in Sydney and 4/5 November 1998 in Wellington, New Zealand. The Committee supported adopting the maximum levels of radiation recommended by ICNIRP accompanied by a to-be-defined 'precautionary approach'.

4.94 A new draft Standard (DR 98627 Radiofrequency fields Part 1: Maximum exposure levels — 3kHz to 300 GHz) was prepared and released for public comment for a period of two months between 1 December 1998 and 31 January 1999. Free public seminars to inform the general public of the content of the proposed Standard were also held because of the public interest in the subject. These took place in Sydney and Melbourne on 9 December and 10 December 1998, respectively.

4.95 The TE/7 Committee considered the public comment and appropriate amendments were made to the draft. A major point of debate was the strength of the proposed 'precautionary approach' given in clause 10 of the Committee ballot draft.

4.96 A formal ballot of the TE/7 Committee was conducted on the modified document. The vote closed on 4 March 1999 without the Standards

62 Standards Australia International Limited, Submission 133, Attachment 5.

Australia/Standards New Zealand threshold of 80 per cent acceptance being reached in either Australia or New Zealand. The result was:[63]

Table 4.3

Result of ballot on draft standard DR 98627

	Accepted	Not accepted
Australia	14	7
New Zealand	6	2

4.97 A process of trying to change negative votes was conducted in accordance with Standards Australia and Standards New Zealand processes. The Interim Standard was due to expire on 5 March 1999 and this date was extended by a vote of the TE/7 Committee to provide time for further discussion. The currency of the Interim Standard was extended until 30 April 1999. Discussions were conducted with all TE/7 Committee members to try to broker a compromise, but Australian members were not persuaded to change their vote. The major sticking point was that negative voters wanted a stronger precautionary approach, but supporters of the ballot draft would not agree as they saw this to be in conflict with the ICNIRP guidelines.

4.98 New Zealand members met on 20 April 1999, when changes to the ballot draft were passed by the necessary 80 per cent acceptance (7 votes in favour, 1 vote against). The New Zealand members agreed that their modified document would be put forward as a New Zealand-only Standard if agreement could not be gained from Australian TE/7 members.

4.99 Agreement did not take place in Australia and a ballot failed to agree to a further extension of the Interim Standard. It was withdrawn on 30 April 1999 and the task of revising the Standard was removed from the Committee's responsibility. The TE/7 Committee has one project currently in abeyance: that is, the EMR testing standard which is part 2 of the AS2772 Standard. The future role of the TE/7 Committee is unclear.

4.100 Although there is now currently no Standards Australia standard for human exposure to electromagnetic radiation, the former Interim Standard continues to be mandated by ARPANSA and the Australian Communications Authority for regulatory purposes.

4.101 According to Standards Australia it is quite unusual for a Committee not to achieve consensus:

> It is very rare that we have not achieved consensus. We publish an average of 40 to 45 standards a month, every month of the year. In the last six or

63 Standards Australia International Limited, Submission 133, p 3.

> seven years, I have not known us not to achieve consensus in publishing standards. So this is a very rare event.[64]

4.102 When asked by the Senate Committee how he accounted for the failure of the TE/7 Committee, Mr Roger Lyle from Standards Australia replied:

> I think if you have a look in detail at the actual process, it really got down to the stage where they hardened their positions. Consensus building means coming up with compromises. After the third meeting of the committee, my view was that there probably would be an outcome. But a few weeks later when the postal ballot was held it was fairly obvious that various members on the committee had hardened their views, for whatever reason. For a period of about six weeks there was an impasse. When we get into a situation where we do not meet our hurdles we go through a process of trying to resolve the issues. We ask people when they vote in the negative to actually provide the reasons for that in order to help the committee try to work through compromises to be able to reach a consensus. It was fairly obvious that people just were not finding those compromises.[65]

4.103 Despite the fact that the TE/7 Committee was unable to achieve consensus in this instance, Dr Black argued that it should in no way reflect on Standards Australia nor on its processes:

> In my opinion the support from Standards Australia during this time was particularly good, and the committee worked well. The limiting factor was the fundamentally flawed idea that a scientifically based document could be produced by a democratic process of requiring virtual consensus from a group which deliberately included people with inevitably dissenting views. Nevertheless, I have no doubt that this was originally done with the best of intentions.[66]

4.104 The Committee notes that Standards Australia was unable to provide the Committee with any adequate reason for not accepting the negative votes from the dissenting members on whether or not to accept the ICNIRP guidelines:

> **CHAIR:** I think this goes to the heart of the whole question: why was it not possible then, having not got over those first two hurdles, to then say, 'There is disagreement on this committee, so let us stay with the current standards?' Why was it necessary to find that compromise and move on? What was the compelling reason for making the shift to the new standard?
>
> **Mr Lyle:** Our process obviously had to come to some sort of conclusion.

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64 *Official Committee Hansard*, Sydney, 16 November 2000, p 282.

65 *Official Committee Hansard*, Sydney, 16 November 2000, pp 283-284.

66 Dr David Black, Submission 93, p 10.

> **CHAIR:** Why couldn't it conclude with the decision for no change? Why couldn't it say, 'The committee does not agree with this direction, and we want to stay with the existing standard?'
>
> **Mr Blair:** To stay with the interim standard?
>
> **CHAIR:** Yes, or make the interim standard the permanent standard.
>
> **Mr Lyle:** We would not agree to it. It was put to a vote.
>
> **Mr Blair:** We went through that process as well, and there was not agreement.[67]

4.105 The Committee Chair is not persuaded that the proposed new standard was a scientifically-based document, however, neither have they found fault with the Standards Australia processes.

The Transfer of Responsibility for Setting a New Australian Standard to ARPANSA

4.106 ARPANSA was established on 5 February 1999 under the *Australian Radiation Protection and Nuclear Safety Act 1998*. The object of the Act is to protect the health and safety of people, and to protect the environment from the harmful effects of radiation. ARPANSA itself is an amalgamation of the Australian Radiation Laboratory, formerly part of the Department of Health and Aged Care, and the Nuclear Safety Bureau, formerly a statutory authority. It comes under the aegis of the Department of Health and Aged Care.

4.107 ARPANSA sought nominations for its Radiation Health Committee (RHC) Radiofrequency (Exposure Standard) Working Group from more than 20 organisations. The final composition of the Working Group is:

Table 4.4

Radiofrequency (Exposure Standard) Working Group[68]

Chair:	Dr Colin Roy, Director, NIR Branch, ARPANSA
Members:	Mr Vitas Anderson, Private Consultant, EME Australia Pty Ltd
	Dr Stan Barnett, Project Leader, Bioeffects of Non-Ionizing Radiation, CSIRO (*has resigned*)

67 *Official Committee Hansard*, Sydney, 16 November 2000, p 284.

68 Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), Submission 128, p 9; ARPANSA Answer to question on notice; Australian Mobile Telecommunications Association (AMTA), Submission 19(a), Attachment E.

	Mr Wayne Cornelius, Head, EMR Section, NIR Branch, ARPANSA
	Mr Dan Dwyer, National Branch Secretary, Telecommunications Officers Association, Communications, Electrical & Plumbing Union
	Dr Bruce Hocking, Consultant in Occupational Medicine
	Dr Ken Joyner, Director, EME Strategy and Regulatory Affairs, Motorola Australia
	Mr John Lincoln, Convenor, Electromagnetic Radiation Alliance of Australia
	Mr David McKenna, National Organiser, Community and Public Sector Union (*has resigned*)
	Dr Andrew Wood, Senior Lecturer in Biophysics, Swinburne University
	Ms Jill Wright, Senior Inspector, Division of Workplace Health & Safety, Queensland Department of Training & Industrial Relations
Consultants	Dr David Black, Occupational & Environmental Physician
	Professor Mark Elwood, Director, National Cancer Control Initiative
Secretariat:	Mr Michael Bangay, Technical Officer, EMR Section, NIR Branch, ARPANSA
	Mr Alan Melbourne, Manager, Standards Development Section, ARPANSA
Observers:	Dr Graeme Dickie, Radiation Health & Safety Advisory Council, ARPANSA
	Mr Ken Karipidis, EMR Section, NIR Branch, ARPANSA
	Ms Judith Lawson, Manager, Research Coordination Unit, Prevention Strategies and Facilitation Branch, National Occupational Health and Safety Commission
	Mr Ian McAlister, Manager, Radiocommunications Standards, Australian Communications Authority

4.108 The ARPANSA Radiation Health Committee (RHC) oversees the work of the Radiofrequency (Exposure Standard) Working Group by setting the terms of reference

and providing guidance and arbitration where necessary. The RHC provides final approval of the Standard and may make amendments at its own discretion.[69]

4.109 Submissions were mixed when addressing this part of the terms of reference. The telecommunications industry, the Australian Communications Authority and other government agencies supported the development of a new standard by ARPANSA:

> It is the ACA's view that given ARPANSA's resources, experience and statutory backing, it is most suited for the standard development task.[70]

4.110 In addition, ARPANSA's expertise in dealing with radiation issues was thought to be invaluable:

> … I believe that the interim standard should be revised to include the ALARA Principle and that the responsibility for doing this should be given to a body with more expertise in dealing with radiation matters, such as ARPANSA.[71]

4.111 The Radiation Advisory Committee of the Victorian Department of Human Services made the point that ARPANSA's international experience in setting standards would be valuable:[72]

> The RAC is of the view that the Australian Radiation Protection and Nuclear Safety Agency would be the most suitable organisation to assume responsibility for developing new Australian Standards for EMR. Several members of staff of this Agency have extensive international experience of setting standards through their involvement in IAEA, ICRP, ICNIRP, etc. They can bring the required scientific rigour to the important tasks involved in setting exposure standards that will protect the Australian population.

4.112 Some submissions provided ideas on the composition of standards setting working groups. For example, Mr Les Dalton stated that:

> … there should be representation on that committee covering the whole spectrum of scientific interpretation of the results as they are at the moment. Also, there should be community representation in order that they can see the process at first hand. There should also be, I believe, not only people who are experts in the technical sense but people who come out of the field of environmental health and perhaps other biological areas. It should be very broad.[73]

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69 Australian Mobile Telecommunications Association (AMTA), Submission 19(a).

70 Australian Communications Authority, Submission 100, p 7.

71 Professor Philip Jennings, Submission 122, p 1.

72 Radiation Advisory Committee of the Victorian Department of Human Services, Submission 106, p 2.

73 *Official Committee Hansard*, Melbourne, 22 September 2000, pp 175-176.

4.113 Mr Dalton believes that it is vital to have sufficient community representation on a standards-setting committee:

> This is where the community has a vital interest in what is decided. Experts are no more able to judge what risk we should be prepared to take than is the community itself. Practising a scientific specialty does not qualify a person to deal with the broader issues associated with the quality of life.[74]

4.114 Other witnesses were opposed to any representatives from the telecommunications industry being on standards-setting committees at all:

> I believe that industry should be excluded. I do not think that industry has a role on standards committees; I think industry should be encouraged to meet whatever standards, from a public health perspective, are decided are appropriate.[75]

4.115 Dr Repacholi informed the Committee that the World Health Organization does not allow industry to participate in either standard setting or in health risk assessment. The WHO takes the view that there cannot be industry representation on standard setting working groups. There cannot be someone on the working group who is having an influence on health effects for an industry when they derive benefit from that industry. He acknowledged, however, that in the United States and Australia a different approach is followed whereby all stakeholders are represented to set standards in order to achieve consensus with the standard.[76] This can be seen by the membership of the Standards Australia TE/7 Committee (see Tables 4.1 and 4.2) and the ARPANSA Radiation Health Committee Radiofrequency (Exposure Standard) Working Group (see Table 4.4).

4.116 Dr Ken Joyner, from the Mobile Manufacturers Forum, thought that excluding industry representatives would have a negative impact on the standards-setting committee:

> I think it would be a very negative impact in that the committee that was set up to, say, look at standards would not be aware of the ease or the ability of some of these requirements to be implemented, would not be aware of what the industry has already done, would not be aware of lots of the data that is already out there. Industry brings lots of experience and knowledge to these forums, and whether they are there as voting members or expert advisers, I think it certainly should not diminish the value that they bring to these bodies.[77]

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74 *Official Committee Hansard*, Melbourne, 22 September 2000, p 172.

75 *Official Committee Hansard*, Sydney, 16 November 2000, p 252.

76 *Official Committee Hansard,* Canberra, 31 August 2000, p 26.

77 *Proof Committee Hansard*, Canberra, 2 March 2001, p 370.

4.117 Those submissions which were opposed to the transfer of responsibility to ARPANSA for devising a new Australian standard, felt that ARPANSA had too close a link to the industry which was pushing for higher exposure levels:

> We are strongly opposed to ARPANSA gaining sole control over the setting of new Australian Standards. We are not convinced that ARPANSA will represent Community concerns and Consumer rights properly and fairly.
>
> ARPANSA appears to us as being market driven and we have no faith whatsoever that they will retain a necessary degree of independence and impartiality under this current Federal Government.
>
> New Standards should only be set by a team that has equal representation from all sectors of the community with equal decision making powers.[78]

4.118 Mr Dan Dwyer, from the Telecommunications Officers Association Branch of the Communications Plumbing Electrical Union, thought that the process used by the Australian Communications Authority to establish the ARPANSA Working Group was flawed. He believed that ARPANSA was not the appropriate organisation to devise the Standard because it had taken a corporate decision to support increased exposures by adopting the ICNIRP Guidelines, as could be seen from the results of the final Standards Australia vote. [79]

4.119 In addition, Mr Dwyer asserted that there is an apparent bias in the ARPANSA Working Group which stems from the selection process for Working Group members not being an open process, with an invitation for inclusion in the group being sent to a chosen few.

4.120 Others thought that ARPANSA could make a profit out of standard setting:

> A new standard must be … set only by a truly independent body, free from industry pressures and financial self-interests. There is no merit in transferring this responsibility to the biased Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). Any organisations who, directly or indirectly stand to profit from electro-magnetic radiation (like ARPANSA), will, naturally, try to impose more lenient standards.[80]

4.121 Dr Loy, Chief Executive Officer, ARPANSA, believed that it is necessary to involve people with an industry background on standards setting bodies, not only because there is a smaller pool of expertise from which to draw in Australia than the rest of the world, but also because it is appropriate:

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78 The Maple Street Cooperative Society Ltd, Submission 90, p 2.

79 Telecommunications Officers Association Branch of the Communications Plumbing Electrical Union, Submission 66, p 9.

80 Ms Sarah Newsome, Submission 12, pp 1-2.

> … you can take a pragmatic view that says that, given the level and the spread of expertise on these issues in this country, if you want to draw up a standard you are inevitably going to have to involve people who have some industry background; otherwise the breadth of knowledge is simply not enough to write the standard. But, having said that, I think you can also say that it is appropriate that people with industry backgrounds be involved because they bring to the issue of the preparation of a standard views and knowledge about how the industry actually works, so that a standard not only protects the public health but does so in a way that will be effective and also allow the benefits of the industry to be offered. That is always a balance. The industry people need to be there to put their side of the case, if you want to view it that way.[81]

4.122 Dr Loy also acknowledged the importance of community representatives on these bodies:

> It is also absolutely important that on the drafting groups there are people from community backgrounds who have an interest in and knowledge about the issues but who do not come from an industry background and who have a community view. That is absolutely important and you should not draw up these standards without that. The other sine qua non is a process of wider public involvement. The issue cannot be resolved behind closed doors; it has to go out to the public widely, and matters that the public bring forward have to be dealt with and be seen to be dealt with.[82]

4.123 Although ARPANSA is a relatively new body, submissions felt that the history of the Nuclear Safety Bureau effectively ruled it out as being an independent and impartial standard setting body. According to Mr Alexander Doull:

> New regulatory agencies are often simply made up of the same people who have been effectively influenced by the very industries they are supposed to regulate, trading under a new name. … this change must not proceed if it has the effect of placing the standard setting process even more securely into the hands of the sectional interests which generate the radiation in the first place and further remove the whole process from public interest and sceptical scrutiny.[83]

4.124 The CSIRO told the Committee:

> ARPANSA was charged with helping to write the new Australian standard and constituted a committee to do that. The CSIRO representative … concluded that the committee seemed intent on adopting the ICNIRP guidelines for RF exposure in Australia without due consideration of all the available evidence and seemed keen to simply adopt that international standard. He therefore resigned from the committee. The conclusions: as I

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81 *Proof Committee Hansard*, Canberra, 2 March 2001, p 344.

82 *Proof Committee Hansard*, Canberra, 2 March 2001, pp 344-345.

83 Mr Alexander Doull, Submission 113, pp 3 and 4.

> said, CSIRO, being a conservative organisation, would always err on the side of prudence and keep exposure levels as low as technically, socially and economically feasible.[84]

4.125 The Committee notes that in the event of a dispute or lack of agreement in the ARPANSA working group over the new Standard including such matters as the inclusion of the precautionary approach, the Standard would be elevated to the Radiation Health Committee who would then take the decision.

4.126 The Committee Chair is of the view that this would negate the advantages of having a fair representation of the various stakeholders on the working group, and it is not persuaded that the TE/7 group's decision not to support the new Standard should have been effectively rejected.

4.127 For this reason, the Committee Chair holds that the process adopted by ARPANSA, particularly with regard to the absence of the CSIRO, has not been an improvement on that of the Standards Australia TE/7 Committee and is not in the interests of public health.

4.128 The Committee Chair remains concerned that members with industry interests on the ARPANSA working group are, despite having no voting rights, in a position to influence the discussion.

Precautionary Approaches

4.129 According to submissions, the major areas of disagreement between the members of the TE/7 Committee and the reason why the new standard was not supported, related to the incorporation of a precautionary approach, and the relaxation of the exposure limits in the proposed Standard. Mr Dwyer from the CEPU said:

> … I oppose adoption of the standard. … In short the proposed standard only pays lip service to the precautionary approach and then sets out to allow even higher exposure levels.[85]

4.130 Because of the growing body of scientific studies that show effects of radiofrequency emissions, as well as the public apprehension with the safety of the technology, people advocated a precautionary approach be incorporated in standards.

4.131 Dr Repacholi argued that present exposure limits are set well below levels at which known adverse health effects are possible: '[t]his is already an application of a 'cautionary policy' and it is important to recognise it as such'.[86]

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84 *Official Committee Hansard*, Sydney, 16 November 2000, p 222.

85 Telecommunications Officers Association, A Branch of the Communications Electrical Plumbing Union, Submission 66, Appendix 3, p 14.

86 World Health Organization, Submission No 56, Appendix: *Background Document Electromagnetic Fields and Public Health, Cautionary Policies* [Draft], p 5.

4.132 The World Health Organization takes the view that whilst technology standards can be used effectively to implement a precautionary approach, until technologies to control exposure are well understood, effective and not unreasonably costly, the precautionary approach is not appropriate for limiting EMF exposures. The WHO submission says that this is because exposures to EMF are so common and occur under such a variety of circumstances that specifying a small number of technologies for controlling exposures would be impractical.[87]

4.133 The Australian Council of Trade Unions (ACTU) was a member of the TE/7 Committee. It did not support the adoption of AS/NZ 2772.1 for the following reasons:[88]

- there was too much reliance in the proposed standard on the ICNIRP guidelines, which are based only on thermal effects and make no allowance for possible non-thermal effects;
- the ICNIRP and its processes have been widely criticised as being far too secretive;
- the proposal to allow increased exposure from mobile telephones for no good reason; and
- the downgrading of the precautionary approach, which was needed in the light of uncertainty regarding the non-thermal risks associated with radiofrequency radiation.

4.134 The ACTU was also concerned that the proposed Standard would allow higher levels of radiation to the head of 25 times the level allowed to the whole body and also, the increase in averaging times from 60 seconds to six minutes. According to the ACTU, these changes would allow higher peak SARs.

4.135 The CSIRO opposed the adoption of the Draft Standard because it considered it imprudent to increase exposures or averaging times above those adopted in Australia in 1985.[89]

4.136 Mr Dan Dwyer from the Telecommunications Officers Branch of the Communications Electrical Plumbing Union was convinced that with the advent of new technologies there will be an increase in radiofrequency exposure even without allowing an increase in levels in the Standard. He cites significant new energy sources such as Fixed Radio Access technology (WLL), high definition television, satellite transmissions and new mobile phones. In addition:

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87 World Health Organization, Submission No 56, Appendix: *Background Document Electromagnetic Fields and Public Health, Cautionary Policies* [Draft], p 5.

88 Australian Council of Trade Unions (ACTU), Submission 89, p 8.

89 CSIRO Australia, Telecommunications & Industrial Physics, Submission 95, p 8.

> The profits from these technologies will be enormous. The benefits will be mostly to multinationals. This has to be balanced against a risk to public safety.[90]

4.137 Whilst many submissions to the inquiry advocated the inclusion of the Precautionary Principle in the Standard, the effect that this would have in practice was not made clear. It is reasonable to assume, however, that people want to be assured that the Government and the telecommunications industry were working to keep emissions to a minimum and that developments should proceed with caution.

4.138 Dr Repacholi warned against departures from the ICNIRP so-called science based standards. He said:

> … a few countries are now introducing additional ad hoc safety factors into the science-based standards as a precautionary measure. This undermines hundreds of millions of dollars worth of science that went into developing the standards, for no apparent benefit to health.[91]

4.139 Dr Repacholi advocated that the precautionary principle be addressed through a separate policy of voluntary precautionary measures:

> These voluntary measures can be through increased research, encouragement of manufacturers to keep exposures to the minimum needed for the technology, better risk communication, targeting audiences with honest and accurate information, public involvement in decision making, and the siting of facilities to minimise public exposure and concerns. People would generally be happy with those sorts of measures because it has their involvement and they do not feel taken out of the equation.[92]

4.140 However the Committee Chair considers that, in view of the internationally accepted definition of the precautionary principle, public consultation does not constitute a precautionary approach unless it is followed by mandatory precautionary action.

4.141 This voluntary approach has been adopted in Australia through the Radiofrequency Electromagnetic Energy Program and a Code of Practice for the Deployment of Radiocommunications Infrastructure, which will be developed and operate in parallel to the proposed new Standard for Exposure to Radiofrequency Fields.

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90 Telecommunications Officers Association, A Branch of the Communications Electrical Plumbing Union, Submission 66, Appendix 3, p 14.

91 *Official Committee Hansard,* Canberra, 31 August 2000, p 6.

92 *Official Committee Hansard,* Canberra, 31 August 2000, p 6.

The Precautionary Principle

4.142 The Precautionary Principle is applied in circumstances where there is scientific uncertainty. It reflects the need to take action for a potentially serious risk without awaiting conclusive scientific research.[93]

4.143 An internationally accepted definition of the Precautionary Principle was summed up in 1992 at the United Nations conference on Environment and Development in Rio de Janeiro.

> Where there are threats of serious or irreparable damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

4.144 Australia's Intergovernmental Agreement on the Environment (IGAE) notes:

> Essentially, the Precautionary Principle offers administrators advice about how to act responsibly in the face of uncertainty and lack of full scientific knowledge. Under this principle, policy makers are advised to use great care when authorising resource use where the outcomes of that use cannot be predicted with confidence, where one or more of the possible outcomes could have extremely adverse implications for future generations, or where no known substitutes exist for the resource being used.

4.145 The European Commission Communication on the Precautionary Principle states:

> The Precautionary Principle applies where scientific evidence is insufficient, inconclusive or uncertain – and preliminary scientific evaluation indicate that there are reasonable grounds for concern that the potentially dangerous effects on the environment, human, animal or plant health may be inconsistent with the high level of protection chosen by the EU.

4.146 According to the draft Background Document from the World Health Organization:

> The Precautionary Principle may be adopted where there is "sufficient evidence" that an action or substance is harmful. Various actions can be taken depending on the strength of evidence, the seriousness of the harm that may be caused, and the degree of uncertainty about whether the harm is likely to occur. Possible choices for action range from prevention or elimination of exposure, to intermediate measures that reduce exposure only when it is cost-effective to do so, to taking no action unless stronger evidence is developed that harm is likely to occur.[94]

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93 World Health Organization, Submission No 56, Appendix: *Background Document Electromagnetic Fields and Public Health, Cautionary Policies* [Draft], p 2.

94 World Health Organization, Submission No 56, Appendix: *Background Document Electromagnetic Fields and Public Health, Cautionary Policies* [Draft], pp 2 and 3.

Prudent Avoidance

4.147 Prudent Avoidance prescribes taking low-cost measures to reduce exposure, in the absence of any scientifically justifiable expectation that the measures would reduce risk. Such measures are generally framed in terms of voluntary recommendations rather than fixed limits or rules.

As Low As Reasonably Achievable (ALARA)

4.148 ALARA is an acronym for As Low As Reasonably Achievable. It is a policy used to minimise known risks, by keeping exposures as low as reasonably possible, taking into consideration costs, technology, benefits to public health and safety and other social and economic concerns. ALARA is mainly used in the context of ionising radiation protection where there is no real lower threshold below which effects do not occur.

4.149 Dr Repacholi maintains that ALARA is not an appropriate policy for EMF (either powerline or radiofrequency fields) because no dose-response relationship has been established at low exposure levels and no mechanism of action is known that could cause any health problems at low levels. The Australian Standard 2772—1985 however incorporated the ALARA principle. According to Dr David Black, this application of the principle has been much criticised since. Reference to it was removed from the draft standard in 1998 and, according to Dr Black, it is not a feature of other international standards.[95]

4.150 Regardless of the names given to the various precautionary policies, submissions to the inquiry made it clear that people want to feel that they are not being exposed to harmful amounts of radiofrequency.

4.151 Those members of the TE/7 Committee who did not support the draft Standard, argued that the precautionary approach had been watered down to an unacceptable level. According to Mr Lyle from Standards Australia, the disagreement arose not over whether a precautionary approach should be included in the Standard, but about the wording of that precautionary approach:

> I think we said that, in the first meeting back in August 1998, that there was general agreement to use ICNIRP with a yet to be worked out precautionary approach. It was in the actual words of that precautionary approach. For the people who voted no, the issue was that it was getting watered down beyond a level which they thought was actually useful at all. It was in the wording, rather than whether it be included or not.[96]

95 Dr David Black, Submission 93, p 14.

96 *Official Committee Hansard*, Sydney, 16 November 2000, p 292.

Inclusion of precaution in the various standards

4.152 Radiofrequency Standards have in the past included reference to precautionary approaches.

AS 2772:1985

4.153 The 1985 Australian Standard included a precautionary approach in the form of the ALARA Principle. In its Preface it stated:

> Moreover it is recommended that the level of all electromagnetic fields should be kept as low as reasonably achievable.[97]

4.154 Clause 2, stated:

> Nevertheless, because of the increasing use of equipment generating radio-frequency radiation and the potential for exposure of individuals, all possible efforts should be made to keep such exposure as low as reasonably achievable (ALARA), below the prescribed limits. The overall economic and social consequences associated with the reduction of exposure to the individual and the public in general shall be taken into account.[98]

4.155 The ALARA Principle is further referred to in Appendix A (Rationale for the development of the maximum exposure levels for radio-frequency radiation) of the 1985 Standard.

AS2772.1:1990

4.156 The 1990 Standard included reference to the ALARA Principle in its Foreword as well as the recommendation that the level of all electromagnetic fields should be kept as low as reasonably achievable.[99] Other references to the principle remained the same as for the 1985 Standard.

AS/NZS 2772.1(Int):1998

4.157 The 1998 Interim Standard omitted reference to the ALARA Principle and instead, referred to the principle of Prudent Avoidance:

> While industry should not exceed the limits in this Interim Standard, exposure to workers and to the public should be kept to the lowest levels that can be achieved consistent with best international contemporary

97 Australian Standard 2772—1985, Maximum Exposure Levels—Radio-Frequency Radiation—300 kHz to 300 GHz, Standards Association of Australia, p 2.

98 Australian Standard 2772—1985, Maximum Exposure Levels—Radio-Frequency Radiation—300 kHz to 300 GHz, Standards Association of Australia, p 5.

99 AS2772.1-1990, Australian Standard, Radiofrequency radiation, Part 1: Maximum exposure levels—100 kHz to 300 GHz, p 5.

> practice and cost effective achievement of service objectives. This approach is consistent with the principle of prudent avoidance. …
>
> **SUBJECT TO THE CONDITIONS OUTLINED ABOVE, EXPOSURES SHALL BE KEPT TO A MINIMUM.**[100]

4.158 The CSIRO in its submission quotes its 1994 report *The Status of Research of Electromagnetic Radiation*: "The problem is that the standards imply safety thresholds but it is not possible to identify these on the basis of current equivocal or disparate research". Furthermore: "Only when a solid database of independently verified quantified bioeffects is available will meaningful safety standards be developed and reassurance of the public be achieved".[101]

DR 98627

4.159 The draft Australian/New Zealand Standard which was put forward for comment as a replacement for the Interim Standard, included reference to a precautionary approach, but this was omitted from the ballot document which was subsequently voted on and for which consensus could not be achieved.

4.160 The Foreword to the draft contained the words:

> This Standard draws extensively on the ICNIRP Guidelines and emphasises the need for a precautionary approach. …
>
> So while the basic restrictions in this Standard shall not be exceeded, the manufacturer/supplier, installer, employer/service provider and user must be able to demonstrate that exposure to workers and the general public is being kept to the lowest level that can be achieved, consistent with best contemporary practices and the cost effective achievement of service objectives. This is consistent with taking a precautionary approach.
>
> This precautionary approach involves application of best contemporary practice in achieving service, or process requirements to minimise incidental RF exposure.[102]

4.161 These words were repeated in clause 10 but later replaced, in the ballot draft with clause 10(d):

> Minimising, as appropriate, RF exposure which is unnecessary or incidental to achievement of service objectives or process requirements, provided that this can be readily achieved at modest expense.

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100 AS/NZS 2772.1(Int):1998, Interim Australia/New Zealand Standard, Radiofrequency fields, Part 1: Maximum exposure levels—3 kHz to 300 GHz, p 5.

101 CSIRO Australia, Telecommunications & Industrial Physics, Submission 95, p 3.

102 DR 98627, Draft Australian/New Zealand Standard for comment, p iv.

> NOTE: Notwithstanding that ICNIRP considers that the basic restrictions and reference levels in this Standard provide adequate protection, it is recognized that community concerns over RF exposure may be able to be addressed by further minimization of exposure in accordance with the requirements of Clause 10(d).[103]

ACIF Code of Practice

4.162 In response to the failure of the Standards Australia process to agree to the new Australian Standard, responsibility was given to ARPANSA to formulate the Australian Standard. In addition, a code of practice was to be developed in parallel with the ARPANSA Standard by the Australian Communications Industry Forum (ACIF). According to the Australian Communications Authority (ACA), '[t]his complementary approach is intended to address both the need for hard exposure limits as well as non-technical matters that are also of concern to the community'.[104]

4.163 The ACIF is the peak telecommunications industry body in Australia which, according to the Australian Communications Authority, plays a critical role in assisting the self-regulation of industry through its work program of industry codes and technical standards.[105]

4.164 The ACA informed the Committee that the Code of Practice will take into account community concerns and draw carriers and service providers into agreement across the area.[106] It is intended that the Code will be registered by the ACA under section 117 of the *Telecommunications Act 1997*. Following registration the obligations on suppliers will become mandatory. The ACA may issue a written notice to a supplier to direct them to comply with the Code under section 121 and/or impose financial penalties for non-compliance.[107]

4.165 The ACIF has established a Radiocommunications Infrastructure Working Committee to develop the Code of Practice regarding electromagnetic radiation for the installation and operation of radiocommunications infrastructure. The Working Committee's task is to identify best practice which keeps radiofrequency exposure to the lowest practical level whilst still delivering a mobile telecommunications service that is cost effective. Design, risk communication and mitigation, and operations will be addressed.[108]

4.166 Members of the Working Committee come from the following organisations:

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103 Committee Ballot draft, p 27.

104 Australian Communications Authority, Submission 100, p 7.

105 Australian Communications Authority, Submission 100, Attachment A, p 13.

106 *Official Committee Hansard*, Sydney, 16 November 2000, p 307.

107 ACIF Draft Industry Code, The Deployment of Radiocommunications Infrastructure, DR ACIF C564, p b.

108 Electromagnetic Energy Public Health Issues Committee (CEMEPHI), Submission 127, p 20.

Table 4.5

Members of the ACIF Radiocommunications Infrastructure Working Committee[109]

Australian Communications Authority	Electromagnetic Radiation Awareness Network
Australian Local Government Association	EMR Alliance of Australia
Australian Telecommunications Industry Association	National Transmission Limited
Cable & Wireless Optus	Orange Hutchison
Communications Electrical Plumbing Union	Telstra Research Laboratories
	Vodafone

4.167 ARPANSA submitted that the Code of Practice will be complementary to the Standard and it is needed for the communications industry to set out how the Standard is met in various settings:

> Such a code may also deal with matters such as public consultation and industry practices taking into account cautionary approaches. … Additional codes of practice will be developed as required for relevant industrial, scientific and medical areas.[110]

4.168 However the Code requires limited public consultation processes and will not be prescriptive as to precautionary measures. Ultimately, this Code gives no assurance that the carriers will not site installations in sensitive areas.

Low impact facilities

4.169 The Committee received numerous submissions which were concerned with the siting of telecommunications towers and especially with the provisions of the low-impact facilities determinations. Ms Gail Darby said:

> I feel strongly that communities must be consulted about the location of all mobile phone towers, including those classified as "low impact". All towers must be subject to a development application to the relevant council. It is unacceptable that current legislation allows industry to completely ignore state and local planning considerations in erecting infrastructure. The government's policy of allowing industry to duplicate infrastructure

109 Australian Communications Authority, Submission 100, Attachment A, p 19.

110 Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), Submission 128, p 8.

> systems, power lines or telecommunications, often many times over, exposes the public to multiple electro magnetic radiation (EMR).[111]

4.170 In order to develop Australia's first mobile phone networks in the early 1990s, Australia's telecommunications carriers were given wide-ranging immunities to town planning laws. With deregulation in 1997, some of these immunities were removed. Guidelines for building visible network infrastructure were set out in a national code devised and implemented by the ACA.

4.171 New or significant additions to towers and buildings were made subject to normal town planning approval and the consultative processes involved. However, under Schedule 3 to the *Telecommunications Act 1997*, those telephone companies licensed by the ACA as carriers, were permitted to install a limited range of facilities without seeking state or territory planning approval. The most common of these are known as low impact facilities and, according to submissions to this inquiry, have become a cause of angst for many people in the community. The Warrimoo Citizens Association said:

> Our Association recently had a confrontation with OPTUS, who without prior consultation, intended erecting Mobile Phone Antennae in the centre of the Village Precinct. A Public Meeting unanimously condemned this action and with the support of our Federal Member and unanimous support of the Councillors from the Blue Mountains City council OPTUS decided to locate in a more isolated area.[112]

> The majority of the citizens of Maleny (Queensland) were upset about the installation of a Digital Mobile Phone antennae on their water tower, because of the unknown effects of the digital radiation on human existence. That water is located in a residential area and only 150 metres from a hospital![113]

4.172 The issue can have broader social concerns in relation to schools and other community bodies that stand to benefit financially from allowing the placement of a tower on their grounds or buildings. Mr John Hyde commented:

> … we are seeing neighbours pitted against neighbours, churches against neighbouring pre-school centres, as telecommunications companies offer building owners money to host these roof-top facilities … Under-funded schools, community groups, churches and strata building owners are tempted by the seemingly high rental a mobile phone company will offer for you to allow them to erect a tower or transmitters on your roof.[114]

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111 Ms Gail Darby, Submission 34, p 1.

112 Warrimoo Citizens Association, Submission 4, p 1.

113 Maleny Residents' Action Group, Submission 86, p 1.

114 Mr John Hyde, Submission 137, p 1.

4.173 The Telecommunications (Low-impact Facilities) Determination 1997 lists those types of facilities defined as 'low impact'. These are facilities which, because of their size and location, are considered to have a low visual impact and do not raise significant planning, heritage or environmental concerns.[115]

4.174 Submissions observed that low impact only refers to low visual impact and not to the amount of electromagnetic radiation emitted. The maximum height of a low impact facility is 6.5 metres and the most commonly installed facility is 5.8 metres high. Overhead cabling and mobile phone towers (which are generally 25 – 30 metres high) are not classified as low impact facilities and their installation requires local council approval. Some other examples of low impact facilities are:

- small radiocommunications dishes and antennae;
- microcell installations;
- in-building coverage installations which are wholly contained and concealed in a building;
- extensions to towers not exceeding 5 metres in height (providing there have been no previous extensions to the tower);
- co-located radio facilities where the total volume of the co-located facilities is no more than 25 per cent greater than the volume of the original facility or the original infrastructure;
- underground cabling; and
- public payphones.

4.175 The Determination also defines where low impact facilities may be installed based on zoning considerations. For example, a facility that is deemed low impact in an area zoned rural or industrial may not be low impact if it is installed in a residential area.[116]

4.176 If a facility is to be installed in an environmentally significant area it cannot be a low impact facility. Areas of environmental significance are identified in the Determination as the following:

- an identified property for section 3A of the *World Heritage Properties Conservation Act 1983*; [the *World Heritage Properties Conservation Act 1983* has since been repealed]

115 Australian Communications Authority, Fact Sheet, *Installation of telecommunications facilities — A guide for consumers*, FSC 30 11/2000, http://www.aca.gov.au/licence/fsc30.pdf.

116 Australian Communications Authority, *Telecommunications Facilities, information for local government*, December 2000, at http://www.aca.gov.au/licence/3352towe.pdf

- an identified property (within the meaning of section 3A of the *World Heritage Properties Conservation Act 1983*); [the *World Heritage Properties Conservation Act 1983* has since been repealed]
- a place that Australia is required to protect by the terms of a listed international agreement;
- an area that is legally designated as a reserve for nature conservation purposes and the principal purpose of the designated reserve is for nature conservation;
- an area that is legally protected from significant environmental disturbance;
- an area that is entered in the Register of the National Estate or the Interim List for that Register;
- an area that is entered in a register relating to heritage conservation; and
- an area that is legally entered in a register or otherwise identified as being of significance to Aboriginal persons or Torres Strait Islanders, in accordance with their traditions.

4.177 A carrier authorised under the Act to install a low impact facility is immune from town planning and environmental laws. When installing low impact facilities, however, the carriers have certain obligations, including:

- taking all reasonable steps to ensure as little damage and inconvenience as practicable is caused;
- taking all reasonable steps to ensure that the land is restored to a condition that is similar to its condition before the installation began;
- acting in accordance with good engineering practice;
- notifying the owner and occupier of the land at least 10 business days before commencing the installation; and
- taking all reasonable steps to co-locate facilities with the existing facilities of other carriers and public utilities.

4.178 Many community groups have been formed with the main objective of opposing the installation of a low impact facility. The major complaints are that these facilities are installed without consultation, they are placed near sensitive places such as schools, nursing homes and hospitals, and in residential areas. The Municipal Association of Victoria is concerned that the low impact facilities determination exemption allows the carriers to bypass the requirements for high impact facilities:

> Councils have reported that Carriers are making minor modifications to high impact facilities so that they resemble low impact facilities and don't require planning approval.[117]

4.179 Suppliers seeking to enjoy the benefits of the low impact facility exemptions must comply with registered Codes.[118] If low impact facilities are deployed without compliance with the ACIF Code of Practice after it is registered with the ACA, they will become subject to state and territory town planning laws.

4.180 For the Committee's recommendation relating to the low impact facility determination, see Chapter 2, Recommendation 2.5.

4.181 Dr Repacholi said he recognises that the public is concerned about mobile telephones and their infrastructure:

> I know that the public has tremendous concerns, and I empathise with those concerns, because the technology has been propagated into people's working and living environments without very much consultation. It is a technology that very few people know much about and, quite reasonably, when such base stations are placed in schools, parents would ask, 'Are there any health effects?' and if we are in a period of debate about the science then that is not very reassuring for parents.[119]

4.182 According to the Australian Mobile Telecommunications Association (AMTA), the industry attempts to limit the amount of mobile phone base stations and to minimise their visual impact:

> There are a large number of base stations in the nation. We recognise that, and the industry is very aware of the visual impact that that creates. There is a concerted effort by industry to co-locate. In fact, there is almost a national average of two carriers per site, per tower. Where we cannot co-locate the industry looks to locate on existing structures such as water tanks and HV [high voltage] powerlines if we can. Again, it has to fit in with the honeycomb network and only where necessary do we opt for a new tower in the area.[120]

4.183 The Australian Mobile Telecommunications Association (AMTA) informed the Committee that it has undertaken three initiatives in relation to concerns over telecommunications infrastructure: a national collocation taskforce, a code of conduct and a 'Know Your Rights' booklet. AMTA informed the Committee that:

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117 Municipal Association of Victoria, Submission 148, p 4.

118 ACIF Draft Industry Code, The Deployment of Radiocommunications Infrastructure, DR ACIF C564, p b.

119 *Official Committee Hansard,* Canberra, 31 August 2000, p 2.

120 *Official Committee Hansard*, Canberra, 8 September 2000, p 33.

> [w]e have become aware that our processes of working with each other to facilitate collocation have not been as good as they could be. We have established a national group to review that and in fact established regional groups in each city to review our processes for collocations to see whether we can do even better.[121]

4.184 The National Collocation Taskforce is designed to get the carriers to work together so that when there has to be a new tower in an area, they go to a local council in twos and threes rather than singly. However, some submissions argue that co-location means an accumulation of radiofrequency emissions. The Sutherland Shire Council, in its submission, outlined the following problem with adding low impact facilities to existing infrastructure:

> After the installation of the high impact facility - additional antennae and dishes may be added to the existing structure as 'low impact' facilities. This can dramatically change the visual impact and EMR emissions associated with the structure which can significantly change the conditions under which approval was granted for the original high impact facility.[122]

4.185 With respect to mobile phone base stations, the Standard requires the aggregate of radiofrequency electromagnetic emissions coming from all antennas on a single tower, or group of towers, to comply with the exposure limit set by the Standard.

4.186 The second AMTA initiative has been the development of the Code of Conduct within the Australian Communications Industry Forum (ACIF), and the third initiative which has been undertaken is to develop a 'Know Your Rights' booklet that is a layperson's guide to the various regulations and regulators to assist communities in understanding their rights in relation to the building of telecommunications infrastructure.[123]

Labelling of phones

4.187 One of the issues relating to a precautionary approach, was a call in the submissions and by witnesses for the labelling of mobile phones. While the debate about safety of radiofrequency radiation continues, the public should be alerted to the fact that the phones do emit radiofrequency radiation and that they should be used with caution.[124]

4.188 The Consumers' Telecommunications Network (CTN), believes that consumers have the right to make informed choices about the purchase and usage of

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121 *Official Committee Hansard*, Canberra, 8 September 2000, p 35.

122 Sutherland Shire Council, Submission 130.

123 *Official Committee Hansard*, Canberra, 8 September 2000, p 35 [Havyatt].

124 Telecommunications Officers Association Branch of the Communications Electrical Plumbing Union, Submission 66, p 8.

mobile phones. It proposes that a mobile phone handset testing and labelling regime be mandated and extra warnings be implemented in relation to the sale of mobile phones to children and young people:

> Many people have concerns or differing perceived needs relating to mobile phones. In an open, competitive market, consumers ought to be able to make informed choices about the product that best suits their needs. Provision of information about choices does not imply that any one option is a health risk. Mobile phone handsets should be labelled with warning information about potential health risks. Information should also be provided about hands-free kits and other adaptive or 'protective' devices intended for use in conjunction with a mobile phone. [125]

4.189 The CTN suggested that, because many factors influence the levels of radiofrequency radiation experienced by the user of a mobile phone, an EME rating scale should be devised and that this EME rating should be indicated on the handset:

> A rating of a number between say, 1 and 10 could be allocated for each factor and added to give a total score. Thus a handset which is very good on one factor and not so good in others might obtain a better score than one which is all round average.[126]

4.190 According to the CTN, the phone should be accompanied by a point of sale leaflet included in the packaging with details of how the rating is calculated.

4.191 The Committee recognises the difficulty in attempting to compare phones because of the complexity of the technical details which the consumer is being asked to assess. Depending on the technology used, there are differences in the output of radiofrequency energy between digital handsets and analogue units, as well as between GSM and CDMA mobile phones. In addition, the output of the most modern handset is adaptively determined by the base station. Consequently, a user's exposure to radiofrequency energy from a high-SAR phone in a region of strong base station signal might easily be lower than from a low-SAR phone in a weak signal area. Although both GSM and CDMA phones are power controlled, when the GSM phone is operating, it is not power controlled to the same extent as the CDMA phone.[127]

4.192 There are also complexities in using the Special Absorption Rate (SAR) to distinguish phones. A decision has to be made whether the peak SAR in the head should be chosen or the 1-gram or 10-gram averaged SAR. An analogue unit which emits continuous wave energy with an SAR near regulatory limits needs to be compared with a digital unit, which emits energy in brief pulses and whose peak SAR

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125 Consumers' Telecommunications Network, Submission 101, p 2.

126 Consumers' Telecommunications Network, Submission 101, p 2.

127 *Proof Committee Hansard*, Canberra, 2 March 2001, p 384 [Bundrock].

might exceed the average SAR from the analogue unit.[128] When a phone is tested in laboratories to determine its SAR, it is done so at its maximum power.[129] The SAR in its normal operation may be significantly lower than this.

4.193 The NATA accredited company Electrical Compliance Testing Association (ECTA), while supportive of a labelling regime which provided SAR values for mobile phones, added the following caution:

> The benefits of publicly available SAR values will only be achieved if:
>
> i. SAR Testing [is] accredited and independent.
>
> ii. A standardised test method [is] used.[130]

4.194 In August 2000, the Australian Communications Authority (ACA) announced that it had reached agreement with AMTA and industry representatives to make information about the maximum emission levels of mobile phones more readily available. This will be a voluntary scheme but the hope is that participating manufacturers will gain a competitive advantage in joining and this will encourage involvement in the scheme.

4.195 According to AMTA, participating AMTA members will make available to consumers information on the SAR of mobile phones.[131] The introduction of this initiative is dependent on the development of an internationally accepted SAR testing methodology and suitable testing equipment becoming available. AMTA expects that resolution of these issues will be some time after April 2001.

4.196 The draft proposal for the mobile phone labelling scheme involves manufacturers placing a label on the outside packaging of the mobile phones. This label will exhibit an 'A-tick' and the text:

> The A-Tick (*show A-tick*) shows this phone complies with all current ACA standards, including for exposure to radio frequency energy.
>
> More information is inside this package or at http://www.amta.org.au/sar

4.197 In addition, participating manufacturers will include information within the product packaging which reiterates that the phone complies with the ACA limits and includes general information on SAR, the standards, as well as the maximum SAR value of the particular phone. This information may be included as an insert or leaflet to be located with the user manual.

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128 Paul Slovic, *Are mobile phones safe? Will people believe mobile phones are safe?* at www.spectrum.ieee.org/publicfeature/aug00/prad.html

129 *Proof Committee Hansard*, Canberra, 2 March 2001, p 366 [Joyner and Harrison].

130 Electrical Compliance Testing Association, (ECTA), Submission 98, p 2.

131 Australian Mobile Telecommunications Association (AMTA), Submission 19(a).

4.198 AMTA also informed the Committee that all manufacturers in AMTA will have a web site that will provide SAR information on their own individual models.

4.199 Whilst the Committee is supportive of any moves by the industry to inform consumers about its products, the AMTA scheme does not seem likely to provide Australian consumers with world's best practice in labelling schemes. The depiction of the A-tick to show compliance with the Standard is already an ACA regulatory requirement for the labelling of mobile phones.

4.200 Generally, submissions to this inquiry wanted SAR information to enable consumers to make an informed choice between phones, and not necessarily to prove compliance with the Standard. If consumers can easily compare emission levels between phones, market forces will act to encourage manufacturers to minimise these levels as those phones with lower outputs may be favoured by consumers. The Committee is of the view that SAR information should be available at the point of sale and not inserted inside the packaging only to be discovered after the phone has been purchased.

4.201 The Committee Chair recommends the following points to convey to purchasers of mobile phones:

- because there is a growing body of evidence indicating biological effects from mobile phones that, as a precautionary measure, it would be advisable to make fewer and shorter calls and to avoid operating mobile phones in situations where they need to use maximum power;
- a graphic illustration of the absorption into the head of radiofrequency radiation;
- specific absorption rate (SAR) values of particular phones and the relevance as a measure of exposure; and
- the effect of hands-free kits and shielding devices on limiting emission levels.

4.202 The Committee notes the contrast between the provision of this information and that proposed by AMTA in its leaflet.

4.203 In addition, the Committee concurs with the recommendations of the Stewart Report:

> 6.77 We recommend that information on SAR values for mobile phones must be readily accessible to consumers:
>
> - at the point of sale with information on the box,
> - on leaflets available in stores giving comparative information on different phones and with explanatory information,
> - as a menu option on the screen of the phone, and as a label on the phone,

- on a national web site, which lists the SAR values of different phone types.[132]

Testing for compliance with the Standard

4.204 The Australian Communications Authority Standard (Radiocommunications (Electromagnetic Radiation—Human Exposure) Standard 1999) is the current Australian Standard with which equipment must comply.

Portable devices

4.205 The manufacturer or distributor of portable devices is responsible for compliance with the Standard. Mobile phones are designed as either Category A or Category B. Category A phones are low power devices with little risk of exceeding the mandatory Standard. Manufacturers of these devices must meet the limits of the Standard but are not required to demonstrate compliance. However, there may be circumstances where the ACA may request evidence of compliance.[133]

4.206 Category B phones are devices that require routine evaluation against the Standard according to the test method given in the Standard. An accredited body must do the test.

Transmitter installations

4.207 Transmitter installations are also divided into two classes, Category 1 and Category 2. The licensee is responsible for compliance with the Standard.

4.208 Category 1 installations are deemed compliant with the Standard for reasons such as low power or inaccessibility, but are not exempt from compliance with the Standard. If there is a reasonable suspicion that an installation is not compliant, the ACA may require the licensee to demonstrate compliance.[134]

4.209 Category 2 installations must be assessed for compliance with the standard. Self assessment of compliance may be permitted.

Criticism of compliance framework

4.210 The Electrical Compliance Testing Association (ECTA) considered that the ACA audits of compliance documentation are not rigorous enough to detect non-compliance:

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132 Independent Expert Group on Mobile Phones (IEGMP), *Mobile Phones and Health*, 2000, p 119.

133 Australian Communications Authority, Submission 100, Attachment A, p 14.

134 Australian Communications Authority, Submission 100, Attachment A, p 14.

> Anecdotal evidence suggests that the audits are simply paper audits that do not scrutinise the technical content of the reports, which are the technical basis for EMR compliance.[135]

4.211 ECTA asserted that the quality of some of the EMR testing is of dubious validity, particularly when carried out by the manufacturers themselves, or by poorly equipped laboratories that do not have adequate test equipment or sufficient expertise. The reports from such laboratories may appear valid but careful scrutiny often shows that the EMR compliance of the subject mobile phone is questionable.

4.212 ECTA believed that the major manufacturers of mobile phones are generally diligent, but it is concerned that the current system is not transparent to the public:

> Our experience is that the top end of town is usually very diligent in what they do with regard to the quality of their testing and compliance requirements. I have to emphasise that. However, the closer you get to the bottom end of the market, the more you will find that the requirements are often ignored. Sometimes they take shortcuts, sometimes they do not bother to do anything and sometimes they just fill out a declaration of conformity without having any basis for that, like a test report. So there is a wide gap between those that are absolutely diligent and those that are just interested in commercial realities, in surviving the next day.[136]

4.213 Dr Repacholi told the Committee that although he has had assurances that mobile phones in Australia comply with the Standard, he would like to see testing of mobile phones:

> If you have a standard, you should determine compliance with it. I do not trust the manufacturers to say, 'Yes, we're doing it'.[137]

Testing of shielding devices

4.214 The Committee received evidence about devices which purport to reduce emissions from mobile phones and other electronic equipment. In some cases, far from reducing emissions, these products can actually increase them. Mr Chris Zombolas, Vice-President, Electrical Compliance Testing Association, told the Committee:

> … a lot of devices are being sold on the market that claim to reduce radiation and hence reduce cancer and all those other effects. We have done a lot of testing for these same suppliers and, in our view, most devices do not work. Perhaps one or two have some basis but, in general, these devices will increase the exposure rather than do what they claim - that is, decrease it. Not only do they increase the exposure but they affect the performance of

135 The Electrical Compliance Testing Association, Submission 98, p 1.

136 *Official Committee Hansard*, Melbourne, 22 September 2000, p 157.

137 *Official Committee Hansard,* Canberra, 31 August 2000, p 13.

> the phone, so you get drop-outs happening very often. The battery goes flat really quickly because it has to raise its power level.[138]

4.215 The Committee is concerned that there is no applicable standard for these devices and nor is there a requirement to test their effectiveness in reducing exposure. For the Committee's recommendations in this regard, see chapter 2, Recommendation 2.4.

Other precautionary measures

4.216 Despite the assurances of AMTA that'[p]resent scientific information does not indicate the need for any special precautions for the use of mobile phones …',[139] the Committee has heard from numerous individuals who wish to apply precautionary measures to their mobile phone usage. According to the IEGMP, they can do this by ensuring that the phone's antenna is fully extended and held away from the head; and by using an approved, hands-free set.[140] In addition, the phone should not be placed against any part of the body when it is turned on.[141] According to the CSIRO, tests done on phones under worst-case conditions (ie with the antenna touching the head) have exceeded the recommended limit in standards, and so it is important that people are made aware of this.[142] The Committee notes newer phones do not have extendable antennas and that many users keep phones clipped close to their bodies for lengthy periods.

Occupational Standards

4.217 Standards Australia originally prepared AS 2772 at the request of the communications industry, to cover both occupational and non-occupational exposure to non-ionising radiation. In the late 1980s it was agreed that AS 2772.1 would be amended to exclude occupational limits if, and when, the National Occupational Health and Safety Commission (NOHSC) published a national standard to cover occupational exposure limits. However the NOHSC working group which was formed to prepare these standards failed to arrive at a consensus solution, and so the Standards Australia standard was never amended in this way.[143]

4.218 The Consumers Telecommunications Network advised the Committee that it had received few inquiries from employers about the possible health risks to

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138 *Official Committee Hansard*, Melbourne, 22 September 2000, p 159.

139 *Official Committee Hansard*, Canberra, 8 September 2000, p 33.

140 Independent Expert Group on Mobile Phones (IEGMP), *Mobile Phones and Health*, 2000, p 119.

141 *Official Committee Hansard*, Melbourne, 22 September 2000, p 158-159.

142 CSIRO Australia, Status of research on biological effects and safety of electromagnetic radiation: Telecommunications frequencies, June 1994, p 129.

143 Standards Australia International Limited, Submission 133, p 1.

employees who are required to use mobile phones for their work. The Committee considers that occupational exposure is potentially a significant health concern.

4.219 The Committee received submissions which criticised both the inclusion of occupational and general standards in the one document and the fact that the occupational standard allows higher exposure than does the general population standard.

4.220 The Committee heard evidence from OneSteel Market Mills which manufactures steel pipe, tube and structural profiles. OneSteel is concerned that its range of magnetic induction heating and welding units has been caught up by the exposure Standard for radiofrequency fields, and that this is inappropriate. OneSteel's concerns extended to the wider metal-manufacturing industry which it contends is generally unaware of the likely consequences, or indeed the existence of the exposure standards. OneSteel advocates that there be a separate standard for the metals industry.[144]

4.221 However, the ARPANSA draft standard is intended to cover the equipment of the metals industry, as Mr Wayne Cornelius from ARPANSA, informed the Committee:

> I see a precautionary approach applying more to the high power industrial uses of radiofrequency, like RF welders, over which we would like to see a bit more control as perhaps significant areas where people may right now be overexposed, as we would see it.[145]

4.222 The Community and Public Sector Union advocated that occupational limits in the Standard should be set at the lower general public exposure limits.[146] It cited research showing that workers operating radiofrequency welders, dryers and induction heaters are being exposed to radiofrequency radiation in excess of the exposure limits.

4.223 The ACTU challenged the assumption that occupational radiofrequency exposures are 'controlled' and that this justifies higher exposures for workers:

> The ACTU would warn against any assumption that occupational exposures to RFR are currently being adequately identified, let alone 'controlled'. There is no justification for workers being exposed to a hazard at levels higher than is allowed for the general public.[147]

4.224 The Committee notes evidence provided by Dr Hocking in relation to the termination of his employment as Chief Medical Officer with Telstra. While the Committee does not wish to comment on this individual case, it supports

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144 BHP Structural and Pipeline Products [OneSteel Market Mills], Submission 77.

145 *Proof Committee Hansard*, Canberra, 2 March 2001, p 347.

146 Community and Public Sector Union (CPSU), Submission 110, p 3.

147 Australian Council of Trade Unions (ACTU), Submission 89, p 13.

Dr Hocking's concern that Chief Medical Officers in any organisation should be able to investigate health issues without interference, in accordance with guidelines to ensure that sound OH&S practices are followed, and employees' health safeguarded.

4.225 The World Health Organization initiative to harmonise EMF standards is, in part, a response to the fact that many countries from the former Soviet Union and Eastern bloc countries are now considering new EMF standards. The Committee has been told that these countries often have exposure levels many times below those of western countries.[148] Dr Repacholi advised that if the limits in those countries were actually complied with, no modern technology would be able to operate.[149]

4.226 Globalisation of trade and the rapid introduction of mobile telecommunications worldwide, have focussed attention on the differences which exist between standards. Differences between standards in Eastern European and Western countries can be large. For example, the levels in the Russian standard are about a thousand times below those in international standards. As emissions from mobile phones are approximately 100 times the levels in this standard, it becomes obvious that the Russian standard cannot be complied with, regardless of its exposure levels.[150] The differences between levels in various countries' standards raise concerns about their safety and have led to public anxiety about increasing EMF exposures from the introduction of new technologies.

4.227 Mr Don Maisch told the Committee that the Russian standards were based on actual effects on workers, whereas the West has concentrated more on the results from high level animal studies when establishing its standards.[151]

ARPANSA Working Group Draft Standard

4.228 The ARPANSA Working Group released its Standard (Radiation Protection Standard Maximum exposure levels to radiofrequency fields — 3kHz to 300GHz) as a draft for public comment on 3 March 2001.

4.229 Dr John Loy, Chief Executive Officer, ARPANSA, emphasised that the draft will be widely available and public comment will be sought by 11 May 2001. After comment is received, the working group will be charged with reviewing the public comment and making such further changes to the draft as it considers warranted. The Radiation Health Committee will receive a revised draft standard from the working group together with a description about how each of the public comments has been addressed.[152] The Committee supports this approach.

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148 Mr Don Maisch, Submission 20.

149 *Official Committee Hansard*, Canberra, 31 August 2000, p 13.

150 *Proof Committee Hansard,* Canberra, 31 August 2000, p 13.

151 *Official Committee Hansard*, Melbourne, 22 September 2000, p 98.

152 *Proof Committee Hansard*, Canberra, 2 March 2001, p 341.

4.230 The Draft Standard determines a number of basic restrictions. These are limits to exposures expressed in fundamental measures, and compliance with these limits would be mandatory. The restrictions are intended to prevent harm at various frequency ranges, arising from electrostimulation of excitable tissue; whole body heat stress; excessive localised temperature rise in tissue; annoying or startling auditory effects; and excessive heating in tissue at or near the body surface.[153] The limits in the draft standard would prevent local temperature rises of no more than about 0.1°C, and there would not be any observable core temperature rises.

4.231 Dr John Loy, Chief Executive Office, ARPANSA, informed the Committee that the Draft Standard defines indicative reference levels from measurable quantities derived from the basic restrictions. These reference levels are required because the mandatory basic restrictions are often specified as quantities that are impractical to measure. The reference levels are intended to be conservatively formulated such that compliance with them ensures that the basic restrictions are met. The reverse does not necessarily apply. It could be that there would be circumstances where reference levels are exceeded but the operator could demonstrate compliance with the basic restrictions:

> In summary, the basic restrictions are the black-letter law; the reference levels are intended to be measurable quantities. If you fall within the reference levels, you are clearly in compliance with the basic restrictions.[154]

4.232 The basic restrictions with their corresponding reference levels appear in the table below:

Table 4.6

ARPANSA Draft Standard - Basic restrictions and corresponding reference levels

Basic restriction	**Corresponding reference levels**
Instantaneous spatial peak current density (3 kHz - 10 MHz)	Instantaneous E and/or H (3 kHz - 10 MHz) and instantaneous contact currents (3 kHz - 10 MHz)
Whole body average SAR (100 kHz - 6 GHz)	Time averaged E and/or H (100 kHz - 6 GHz)

153 *Proof Committee Hansard*, Canberra, 2 March 2001, pp 341-342 [Loy].

154 *Proof Committee Hansard*, Canberra, 2 March 2001, p 342 [Loy].

Spatial peak SAR in limbs (100 kHz - 6 GHz)	Time averaged E and/or H (100 kHz - 6 GHz) and/or induced limb currents for the legs and arms (10 MHz - 110 MHz) and contact point currents (100 kHz - 110 MHz)
Spatial peak SAR in head & torso (100 kHz - 6 GHz)	Time averaged E and/or H (100 kHz - 6 GHz)
Instantaneous spatial peak SAR in head & torso (10 MHz - 6 GHz)	Instantaneous E, H or power flux density (10 MHz - 6 GHz)
Spatial peak SA in the head (300 MHz - 6 GHz)	Instantaneous E , H or power flux density (300 MHz - 6 GHz)
Time averaged and instantaneous power flux density (6 GHz - 300 GHz)	Time averaged and instantaneous E or H (6 GHz - 300 GHz)

4.233 The basic restrictions are intended to prevent harm at various frequency ranges as follows:

- electrostimulation of excitable tissue (3kHz-110 kHz);
- whole body heat stress (100kHz-6GHz);
- localised temperature rise - head, torso and limbs (100kHz-6GHz);
- microwave hearing effect (300MHz-10GHz); and
- excessive tissue heating at/near body surface (6-300GHz).[155]

4.234 Dr Loy told the Committee that the Draft Standard adopts the ICNIRP restrictions and reference levels, but it extends the ICNIRP Guidelines in several ways. The Draft Standard includes additional basic restrictions to protect against pulses, and a reduced frequency cut-off for specific absorption rate and specific absorption from 10 gigahertz to 6 gigahertz, which gives better protection against surface heating. There is better continuity in the reference levels across the frequency bands, in addition, it is more conservative at some point frequencies. Finally, the draft standard has been rigorously defined to work as a standard rather than simply as guidelines - it provides unambiguous limits for exposures.[156]

4.235 Mr Wayne Cornelius, Manager, EMR and Laser and Optical Radiation Branch, ARPANSA, elaborated on these points for the Committee:

155 ARPANSA/CEMEPHI, Overhead presentation at hearing on 2 March 2001, Canberra.

156 *Proof Committee Hansard*, Canberra, 2 March 2001, pp 342-343.

> … instantaneous spatial peaks are an additional basic restriction that we have added. It is implied in the ICNIRP guidelines, but it is something that we have had to identify clearly as being part of the standard and as a basic restriction. Also spatial peak specific absorption in the head, as related to very short pulses, was something that was implied in a footnote to one of the ICNIRP basic restriction tables, but we have drawn it out to clearly show that that is what is intended.[157]

4.236 These additional basic restrictions should address the concerns expressed by witnesses about averaging times. In the draft standard it is clear that high bursts of EMR which go above the basic restrictions will not be permitted by the standard.

4.237 Despite claims in submissions and by witnesses that the ARPANSA Working Group had been directed not to include a precautionary approach in the new Standard, the draft document does include a form of precautionary approach. Section 5 of the Standard (Protection - Occupational and general public exposure) states:

> It is generally sensible in achieving service or process requirements to minimise unnecessary or incidental RF exposure, provided it does not introduce other risks and can be achieved at modest expense.[158]

4.238 In addition, Annex 6 to the Draft Standard discusses 'A public health precautionary approach to radiofrequency radiation'. There are also additional precautions for pregnant workers who should advise their employer when they become aware of their pregnancy, after which they must not be exposed to RF fields exceeding the general public limits. This is to reduce the risk of accidental exposure to RF fields in excess of the occupational limits.

4.239 The very recent release of the Draft Standard has meant it has not been possible for the Committee Chair to check the validity of ARPANSA's assurances.

Conclusion

4.240 Having reviewed the evidence, the Committee Chair does not support the decision to transfer the responsibility for setting a new Australian Standard for electromagnetic radiation to the Australian Radiation Protection and Nuclear Safety Agency.

4.241 The Committee Chair does not have a view as to which body should be charged with the responsibility for standard setting but believes that the process should ensure that the scientific advice which informs the decision-making should be completely independent of commercial interests and that consumers and other non-commercial stakeholders should be involved in the voting process.

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157 *Proof Committee Hansard*, Canberra, 2 March 2001, p 343.

158 Radiation Protection Standard Maximum exposure levels to radiofrequency fields — 3kHz to 300GHz, ARPANSA, Draft for Public Comment, p 22.

4.242 The Committee Chair, on reviewing the evidence, does not support the implementation of standards which are in line with the ICNIRP Guidelines, but instead recommends that the level of 200 microwatts per square centimetre in the expired Interim Standard (AS/NZS 2772.1(Int):1998) be retained in the Australian Standard.

Recommendation 4.1

The Committee Chair recommends that the radiofrequency standard be defined and administered by a process similar to that used by Standards Australia.

Recommendation 4.2

The Committee Chair recommends that the level of 200 microwatts per square centimetre in the expired Interim Standard (AS/NZS 2772.1(Int):1998) be retained in the Australian Standard.