

THE PROCRUSTEAN APPROACH

Setting Exposure Standards for Telecommunications Frequency Electromagnetic Radiation



An examination of the manipulation of telecommunications standards by political, military, and industrial vested interests at the expense of public health protection

Chapter 4

The WHO's International EMF Project (IEMFP) and the International Commission on Non-Ionizing Radiation Protection (ICNIRP)

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The Procrustean Approach

According to ancient Greek legend there once lived in Attica a bandit named Damastus or Polypemon, who was nicknamed Procrustes, or “The Stretcher”. He was known to entice, by force if necessary, passing members of the public to lie down on his iron bed. If they were too long he would cut off their limbs in order to fit the bed. If they were too short he would place them on a rack and stretch them until they would fit the dimensions of his bed – referred to as the Procrustean bed. Procrustes was eventually slain by his own method (cover image) by Theseus, a legendary king of Athens who, as a young man, had the habit of slaying robbers and monsters whenever he encountered them on his travels.

One of the derived meanings of Procrustean bed is an arbitrary standard to which exact conformity is forced. It was used to refer to Western radiofrequency (RF) human exposure standard setting by Professor V. V. Parin, a member of the USSR Academy of Medicine and quoted in the Foreword of A. S. Presman’s book *Electromagnetic Fields and Life* (1970).

In the case study of the Standards Australia TE/7 Committee: Human exposure to electromagnetic fields (Chapter 5) the central issue of discussion was what constituted a suitable precautionary approach when setting RF exposure standards in order to address scientific uncertainty and provide adequate public health protection. That committee was ultimately disbanded because a suitable definition of a precautionary approach could not be agreed to and the proposed standard, based on the ICNIRP guidelines, was therefore unable to gain the required 80% approval in order to be passed.

This thesis contends that, rather than taking a precautionary approach, Western standard setting organisations such as the IEEE and ICNIRP have actually followed what can best be described as a Procrustean approach. This approach consists of cutting off from consideration scientific data that does not conform to their bed of knowledge. Such an approach can be considered just as inimical to public health protection as was Procrustes’ mythical bed for the public of his time.

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Chapter 4

The thermal paradigm spreads internationally

The WHO's International EMF Project (IEMFP) and the International Commission on Non Ionizing Radiation Protection (ICNIRP)

While all the scientific literature was reviewed, the only adverse effects on humans that were fully verified by a stringent evaluation were short term, immediate health consequences such as stimulation of peripheral nerves and muscles, functional changes in the nervous system and other tissues, shocks and burns caused by touching conducting objects, and changes in behaviour caused by elevated tissue temperatures. There are also data for chronic low level exposure that indicate that there may also be other health effects. It is, however, ICNIRP's view that in the absence of support from laboratory studies the epidemiological data are insufficient to allow an exposure guideline to be established.

ICNIRP Statement, Mar 31, 1999¹

Listen to both sides and you will be enlightened; heed only one side and you will be blinded. We are facing a big knowledge gap in evaluating EMF health risk at this stage. This is the reason why there is no satisfactory and generally acceptable EMF standard around the world. I think an international EMF exposure standard might only be established on the principle of science and democracy, on the principle of mutual understanding and to reach unanimity through consultation.

Professor Huai Chiang²

Overview

Although the IEEE's C95.1 standard and the ICNIRP RF guidelines, promoted by the WHO's International EMF Project (IEMFP), may appear to be two distinct entities, they share common roots grounded in the 1950s development of the thermal approach towards RF biological effects in the U.S. and embodied in the IEEE C95.1 RF standards. The lineage between IEEE and the establishment of an international thrust through WHO was briefly mentioned in Chapter 3. Thus, all the factors explored in the previous chapter on the development of C95.1 are also a common inheritance for ICNIRP's thermal emphasis. As with C95.1, ICNIRP claims that the only proven hazard from exposure to RF is heating at acute (high level) exposures, below which no health effects occur. Unlike the IEEE standards process, where industry and military interests openly take centre stage in standard setting, IEMFP and ICNIRP's RF risk assessment process claims to be independent from industry influence with ICNIRP members barred from being in the employ of industry. This stipulation also applies to all members on IEMFP's task working groups. In addition ICNIRP members are not paid for their work for the Commission and ICNIRP does not accept funding from industry. These stipulations are supposed to ensure that IEMFP and ICNIRP both remain as independent advisory bodies, untainted by an industry bias that would bring doubt on their scientific credibility. Much of the information that ICNIRP provides is published in the form of scientific reviews and reports and the proceedings of scientific meetings. The results of these reviews, combined with risk assessments carried out in collaboration with IEMFP, result in the publication by ICNIRP of Exposure Guidelines. Examples of these are guidelines limiting exposure to electromagnetic fields, to laser radiation, to ultraviolet

¹ ICNIRP, 'Use of the ICNIRP EMF Guidelines' Mar. 31, 1999, <http://www.icnirp.de/documents/Use.htm>, Accessed Feb. 4, 2009.

² Opening remarks by Professor Huai Chiang at the 3rd International EMF Seminar in China, 13-17 October 2003.

radiation, to incoherent optical radiation and to ultrasound. In relation to electromagnetic fields in the range of 0 to 300 GHz the WHO runs the IEMFP that is developing a risk assessment framework for a global standard for this frequency range. This chapter examines the various factors that influence the risk analysis philosophy that lies behind both IEMFP and ICNIRP's determinations. In this regard, Chapter 1 establishes the background to this discussion.

It needs to be said at this point, however, that this chapter (4) is not intended to be a critique of ICNIRP's scientific data-base in relation to providing protection from thermal hazards of high-intensity RF exposure. This data-base, essentially the same one which IEEE C95.1 is based upon (Chapter 3), is quite extensive in its understanding on how high-intensity RF exposure can damage biological tissue, based on animal research. This is then extrapolated to what is thought would happen in the human body under similar exposure situations. In this regard, ICNIRP's RF standards, as with IEEE C95.1, can be said to provide a level of protection against thermal biological damage from acute short-term exposures. In ICNIRP's latest review of the literature (2009) they concluded that "the most marked and consistent effect of RF exposure is that of heating" and that "the plausibility of various non-thermal mechanisms that have been proposed is very low"³ Taking ICNIRP's advice, many governments have incorporated ICNIRP's thermal based guidelines into their national RF standards with ICNIRP promoting an international harmonization of all national RF standards based on these guidelines. ICNIRP's other guidelines for Laser, ultraviolet, incoherent optical and ultrasound radiations are not part of this thesis discussion.

The central argument in this chapter is that IEMFP and ICNIRP claims of independence from industry (which should also include military interests – although this is not mentioned) must be considered a necessary requirement for their scientific credibility. This is especially so as this has been specifically stated by Michael Repacholi, the founder of both ICNIRP and IEMFP. As is seen, however, these claims do not stand up under examination in the case study of IEMFP's Task Group writing a new Environmental Health Criteria for power frequency EMFs. In stark contravention of WHO guidelines to ensure that WHO processes were not undermined (addressing the tobacco industry attempts to do so) the IEMFP Task Group had direct representation by power industry representatives, at the invitation of Repacholi. At the group meetings industry representatives played a central role in influencing the decision making process in a similar way, as was examined in the IEEE C95.1 RF standard setting process in Chapter 3. Also examined in this chapter are a number of national situations where the ICNIRP RF Guidelines have been presented as a virtual "Gold Standard" which all nations should adopt (harmonize with). Although ICNIRP claims that economic considerations are not part of their advice, these considerations have formed a major part of the push to accept ICNIRP's Guidelines, even at the expense of conflicting science that questions the safety of those guidelines (Russia, the Czech Republic and China). Another important dimension behind the push for international harmonization examined in this chapter is the hidden role of the U.S. Department of Defense (DoD) in maintaining the thermal paradigm via. ICNIRP in order to protect its significant investment in global missile defence radar systems.

³ ICNIRP, 'Exposure to high frequency electromagnetic fields, biological effects and health consequences (100 kHz-300GHz)' ICNIRP 16/2009. <http://www.icnirp.de/documents/Rfreview.pdf>, Accessed Mar. 25, 2010.

The WHO International EMF Project

The WHO International EMF Project (IEMFP) was established by Michael Repacholi in 1996 and he was in overall charge of the project until his retirement in June 2006. The organization is made up of three main committees: an International Advisory Committee; a Research Coordinating Committee; and a Standards Harmonization Committee.⁴ A large number of international and national agencies that have responsibilities in non-ionizing radiation issues are members as well as a number of collaborating institutions. International organizations include the International Labour Organization (ILO); the International Electrotechnical Commission (IEC), the International Agency for Research on Cancer (IARC), the North Atlantic Treaty Organization (NATO); the European Commission (EC); and ICNIRP, a non-government organization authorized by WHO to deal with non-ionizing radiation protection.⁵ IEMFP work does not involve developing standards. This a task left for ICNIRP. Its primarily function is to conduct a three-part risk analysis consisting of risk assessments derived from the scientific literature; risk management in the form of recommending a global standard, the ICNIRP Guidelines; and risk perception/ communication in the form of various public relations mediums, such as web sites, fact sheets, seminars, working groups, etc. An important feature of the overall IEMFP risk assessment process is the work of WHO Task Groups that help determine health risk assessments that make up WHO Environmental Health Criteria publications, which are then used to derive ICNIRP's guideline recommendations.⁶

Establishment and make-up of ICNIRP

The foundations of an international effort to address both ionising and non-ionizing radiation protection can be traced back to the American Health Physics Society (HPS), founded in 1956, a year before the establishment of the U.S. Tri-Service Research Program (Chapter 3, pages 83-86). In the early 1960s an HPS committee was established to explore the need for an international health physics organization and through the work of this committee the International Radiation Protection Association (IRPA) was founded in 1964 representing 15 health physics and radiation protection national societies.⁷

In 1971 WHO convened a working group meeting which recommended that the protection of humans from exposure to RF/MW should be a high priority. This led to a meeting of the 3rd International IRPA Congress in 1973 where the first session to address non-ionizing radiation protection was established. This was followed up in 1974 by the formation of a Working Group on non-ionizing radiation and in 1975 by a study group to review the field of non-ionizing radiation. In 1977, at the 4th IRPA International Congress, the International Non-Ionizing Radiation Committee (INIRC) was created and in 1981 a joint WHO/IRPA group issued the first Environmental Health Criteria for

⁴ IEMFP, 'The International EMF project Progress report 2001-2002', http://www.who.int/entity/peh-emf/project/en/PR2001_2002.pdf, Accessed Sept. 4, 2008.

⁵ M. Repacholi, Inquiry into Electromagnetic Radiation, Standing Committee on the Environment, Communications, Information Technology and the Arts, (Australian Senate) May 2001. Testimony of Michael Repacholi, Sect. 2.233, pp. 76-77.

⁶ IEMFP Progress Report 2001-2002.

⁷ IRPA, Foundation, http://www.irpa.net/index.php?option=com_content&task=blogcategory&id=178&Itemid=113 Accessed Sept. 6, 2008.

Radiofrequency and Microwaves. In 1988 Repacholi was appointed Chairman of INIRC till 1992 when he became Chairman of INIRC's replacement, ICNIRP at the IRPA 7th International Congress⁸. ICNIRP then adopted Repacholi's 1984 IRPA proposal that the only health issue to address in standard setting were short-term effects due to the absorption of RF/MW energy of sufficient power to be converted to heat. The frequency range of 10 MHz to 10 GHz was selected with a basic restriction for whole-body Specific Absorption Rate (SAR) derived from a SAR of 4 W/kg.^{9 10} The ANSI/IEEE C95.1 1982 RF standard was referenced in Repacholi's 1984 proposal later adopted by ICNIRP¹¹. In their historical review of the development of Western RF standards, IEEE C95.1 committee members Osepchuk and Petersen (2003) mention that C95.1 became the foundation for most contemporary RF standards (including ICNIRP) and was based on a simple thermally orientated biological endpoint of observed disruption of food motivated learned behaviour in laboratory RF exposed animals.¹² A very influential book at the time also supported the developing international thermal-effects-only paradigm and was written by the North Atlantic Treaty Organization (NATO) with Sol Michaelson, who played a central role on the development of C95.1 from the original 1950s Tri Services Project, being a major contributor to the 1983 document. Michaelson's paper laid out the thermal fundamentals and biological interactions of RF exposure.¹³ Thus a significant amount of sharing of ideas had taken place between the IEEE C95.1 standard setters and the international development of ICNIRP's RF guidelines with a thermal emphasis taken as the scientific basis for RF standard setting.

Unlike the IEEE standard setting process, where a number of individuals played a role in the formation of C95.1, both IEMFP and ICNIRP were established, chaired and guided for many years by just one person, Michael Repacholi. He was a founding member of INIRC/IRPA, chaired both INIRC and ICNIRP and In May 1996 was elected Chairman Emeritus of ICNIRP. He was also the founder and head of IEMFP from its beginning in 1996 until his retirement in June 2006¹⁴. Thus a history of the two organizations is very much a history of the activities of Michael Repacholi in his international promotion of the thermal-effects-only philosophy in RF standard setting.

The current ICNIRP Guidelines, as published in *Health Physics* in 1998, are a reconfirmation of the earlier INIRC guidelines published in 1988 which were, in turn, based on the 1984 interim INIRC guidelines. The 1984 interim guidelines were based on the 1981 review of biological effects compiled by the United Nations Environmental

⁸ ICNIRP, Aim and Roots, 2007, <http://www.icnirp.de/aim.htm>, Accessed Apr. 2, 2008.

⁹ M. Kundi, Environmental Health Issues of Radiofrequency and Microwave Exposure, [http://www.salzburg.gv.at/Proceedings_\(06\)_Kundi.pdf#search=%22Environmental%20Health%20issues%20of%20Radiofrequency%20and%20Microwave%20Exposure%22](http://www.salzburg.gv.at/Proceedings_(06)_Kundi.pdf#search=%22Environmental%20Health%20issues%20of%20Radiofrequency%20and%20Microwave%20Exposure%22), Accessed Oct. 9, 2006.

¹⁰ R. Repacholi, 'Problems with Regulating Radiofrequency (RF) Radiation Exposure', IRPA 6, May 1984, pp. 1291-1294, http://www.2000.irpa.net/irpa6/cdrom/VOL.3/B3_96.PDF, Accessed Sept. 4, 2008.

¹¹ Repacholi, 1984.

¹² J. Osepchuk, R. Petersen, 'Historical Review of RF Exposure Standards and the International Committee on Electromagnetic Safety (ICES)', *Bioelectromagnetics*, Supplement 6, 2003, pp. S7-S16.

¹³ M. Grandolfo, S. Michaelson, A. Rindi, *Biological Effects and Dosimetry of Nonionizing Radiation: Radiofrequency and Microwave Energies*, NATO Advanced Study Institute on Advances in Biological Effects Dosimetry and NATO Scientific Affairs Division, Plenum Press, 1983.

¹⁴ ICNIRP, 'Main Commission: Members' Biographical Information', 2008, <http://www.icnirp.de/cv.htm#Repacholi>, Accessed Sept. 12, 2008.

Program (UNEP) /WHO/IRPA as Environmental Health Criterion 16¹⁵. ICNIRP was established as a body of scientific experts consisting of a main Commission of 14 members, 4 Scientific Standing Committees covering Epidemiology, Biology, Dosimetry and Optical Radiation and a number of consulting experts. The stated mission of ICNIRP and its various committees and consultants is to address and provide expert advice on the possible adverse effects on human health of exposure to non-ionizing radiation. ¹⁶ For the purposes of this thesis, ICNIRP's guidelines for exposure to radiofrequency and microwave exposure are examined. ICNIRP's exposure guidelines for Extremely Low Frequency (ELF) power frequency electric and magnetic fields, while outside the scope of this thesis, are useful in the examination of industry influence and conflict of interest in developing expert advice. This is examined below in relation to an IEMFP task group in charge of writing a new environmental health criteria for power frequency extremely low frequency (ELF) EMFs.

According to the ICNIRP web site, ICNIRP's members are independent experts in the scientific disciplines necessary for non-ionizing radiation protection. The main Commission members are elected by the Commission under the rules of its Charter. Nominations are invited from all the national radiation protection bodies represented by IRPA, and from ICNIRP's main Commission itself. The Chairman and Vice-chairman of the Commission are elected by the members of the main Commission. Individual membership of the main Commission is limited to 12 years. Members of the Scientific Standing Committees are nominated by the Chairmen of the Standing Committees and the members of the main Commission and agreed by the main Commission. Consulting experts are similarly nominated and agreed. ICNIRP Commission members are not supposed to represent either their countries of origin or their institutes nor can they be employed by industry. Members are reminded frequently of the need to declare any interests detrimental to ICNIRP's status as an independent advisory body.¹⁷ This system of selecting members is based on an assumption that there can be scientific objectivity and therefore ICNIRP committee scientists should decide who are suitable to be involved in developing (or maintaining) ICNIRP's guidelines. However, if we assume that decision making within the regulatory framework does not exist without some level of value judgements, then ICNIRP's membership mechanism will tend to reinforce any existing tendencies (or biases) amongst the group. One example of such a bias could be the fundamental tenet of ICNIRP that the only biological hazards from RF exposure are thermal in nature. This tendency is also seen in the various committees that were involved in writing the various versions of the IEEE's C95.1 RF standard as examined in Chapter 3 where RF thermal considerations became an unquestionable guiding principle. With the ICNIRP selection process, scientists who support the possibility of hazardous effects below the standard guidelines would be unlikely to be invited onto an ICNIRP committee.

Statements on RF/MW adverse health effects

According to Repacholi, IEMFP's (and therefore ICNIRPs) understanding is that:

¹⁵ WHO, Environmental Health Criteria 16: Radiofrequency and Microwaves. World Health Organization, Geneva, 1981, *International Journal of Radiation Biology*, Vol. 42, Issue 3, Sept. 1982, p. 354.

¹⁶ ICNIRP's committees also issue advice on the optical radiations (ultraviolet, visible and infrared - and lasers).

¹⁷ ICNIRP, 'An Independent Voice In NIR Protection', 2007, <http://www.icnirp.de/what.htm>, Accessed Sept. 12, 2008.

[T]he known hazards of exposure are to high levels of RF fields, which result in tissue heating and form the basis for current international RF standards (ICNIRP, 1998). Thermal hazards are associated with acute exposures and are thought to be characterised by threshold exposures, below which no health effects occur. There is no confirmed evidence that exposure to RF fields has any long-term health consequences.¹⁸

This advice has remained unchanged since his 1984 IRPA proposal that the only health issue to address in standard setting were short-term effects due to the absorption of RF/MW energy of sufficient power to be converted to heat.¹⁹

According to Paolo Vecchia, the current Chairman of ICNIRP, the only established effects from exposure to RF/MW electromagnetic energy is an increase in body temperature (Thermal effects) which are related to the Specific Absorption Rate (SAR) which is the energy absorbed per unit time and per unit mass (W/kg). "There is no convincing evidence that exposure to RF shortens the life span of humans, induces or promotes cancer."²⁰

Conflict of Interest or a shared interest?

ICNIRP is registered in Germany as a non-profit making organization. All its income is used to offset the year-on-year costs of its various activities including carrying out its scientific programme, organising scientific meetings and producing scientific publications. Its income derives from various sources and it claims to not accept funding from industry. The regular income that ICNIRP receives is an annual grant from IRPA. It has also received support from national governments, most notably from the German Environment Ministry for ICNIRP's Scientific Secretariat based in Munich. All other income is generated by the Commission through contract work (to the exclusion of any work for industry), organization of scientific meetings and sales of its scientific publications. Currently, ICNIRP's contract income comes from contracts placed by various organizations such as the European Commission to produce a review report on possible health effects from the use of electronic surveillance devices; from WHO to carry out scientific reviews of the epidemiology, biology and physics and engineering aspects of exposure to extremely low frequency electric and magnetic fields; and the International Labour Organization, ILO, to produce a Health and Safety at Work Publication on protecting indoor and outdoor workers from ultraviolet radiation. ICNIRP also receives income from the sales of its publications that defray some of its expenses. As stated previously, ICNIRP members are not paid for their work for the Commission - it is entirely voluntary. Only travel and necessary costs for attendance at meetings are reimbursed to members.

¹⁸ M. Repacholi, Conference statement by Repacholi as quoted in: Maisch D, *Report on the International Conference: 'Mobile Communications and Health: Medical, Biological and Social Problems'*, Sept 20-22, 2004, Moscow, Russia, European Biology and Bioelectromagnetics, Vol. 1, Issue 1, January 2005.

¹⁹ Repacholi, 1984.

²⁰ P. Vecchia. 'Epidemiological results and Policy Implications' Electromagnetic Fields and Epidemiology, Erice, Italy, Mar. 26-Apr. 2, 2008, http://www.ccsem.infn.it/ef/emfesc2008/bioelectromagnetics/Vecchia_Epidemiology%20and%20Guidelines.ppt.pdf Accessed Apr. 2, 2009.

At the Australian Senate Inquiry into Electromagnetic Radiation (2000-2001) Michael Repacholi informed the Senate Committee that the WHO had a firm policy against industry involvement in its processes. To quote:

[T]he 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.²¹

ICNIRP clearly states on its website that in order to maintain this independence from industry or other vested interests it is stated:

Members are reminded frequently of the need to declare any interests detrimental to ICNIRP's status as an independent advisory body. [And]: ICNIRP as an organization does not accept funding from industry. [And in summary]: "ICNIRP is independent from industry in both membership and funding."²²

These requirements were established so that the credibility of ICNIRP's advice could not be said to be influenced by industry vested interests. Dr. Ken Joyner from Motorola stressed the independence of ICNIRP from industry at the Australian Senate "Inquiry into Electromagnetic Radiation Joyner stated:

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 if you are part of industry. They exclude you from that process.²³

Scientific literature reviews by ICNIRP members are combined with risk assessments carried out by IEMFP with the resultant being the publication of ICNIRP's EMF exposure guidelines.²⁴ Therefore claims that ICNIRP's scientific advice is value-free from industry influence must also include the same requirement of IEMFP's risk assessment task groups. That was what Repacholi clearly stated to the Australian Senate Committee in May 2001 (as quoted previously). "There cannot be someone on the [IEMFP] working group who is having an influence on health effects for an industry when they derive benefit from that industry"

The close working relationship between ICNIRP and IEMFP's task group assessing the power frequency (extremely low frequency) scientific literature for a new Environmental Health Criteria was seen in the make up of the membership of the WHO task group as of October 2005. Out of the 20 members from 17 countries²⁵, there was Paolo Vecchia, the current ICNIRP Chairman, Anders Ahlbon, Larry Anderson, and Rudiger Matthes as members of ICNIRP's main commission, with Ahlbon also on ICNIRP's Standing Committee on Epidemiology. Other ICNIRP Standing Committee members included

²¹ Repacholi, 'Inquiry into Electromagnetic Radiation...', 2001, op. cit., Section 4.115, p. 151.

²² ICNIRP, 'An Independent Voice...', 2007.

²³ K. Joyner, Inquiry into Electromagnetic Radiation, Standing Committee on the Environment, Communications, Information Technology and the Arts, (Australian Senate) May 2001, Section 4.68, page 137.

²⁴ ICNIRP, 'An Independent Voice...', 2007.

²⁵ L. Slesin, 'WHO Welcomes Electric Utility Industry To Key EMF Meeting, Bars the Press', *Microwave News*, Sept. 22, 2005 <http://www.microwavenews.com/fromthefield.html#partners>, Accessed October 10, 2005.

Christoffer Johansen, Jukka Juutilainen, Alasdair McKinlay and Zhengping Xu. Eric van Rongen is a consulting expert for ICNIRP. The task group also included, Michael Repacholi, head of IEMFP and Chairman Emeritis of ICNIRP.²⁶ Including Repacholi, exactly half of the make up of the IEMFP task group were also members of ICNIRP, so it is obvious that there would be no secrets between ICNIRP and IEMFP.

As reported by the New York based publication *Microwave News*, on October 1, 2005, the 20 member IEMFP Task Group writing a new Environmental Health Criteria (EHC) document on power frequency EMFs, included, at the request of Repacholi, representatives from the electrical utilities, or organizations with close ties with the industry. Their tasks were to assist in writing the initial draft and review the completed draft.²⁷ This is in clear conflict with what Repacholi stated in his testimony at the 2001 Australian Senate inquiry hearings: "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." One of the central authors of the draft, and member of the WHO's EHC Task Group, Leeka Kheifets, was a former IEMFP assistant to Michael Repacholi. She disclosed in Sept. 2005 in a letter (declaring any potential conflicts of interest) to the *British Medical Journal* that she "works with the Electric Power Research Institute [EPRI]... and consults with utilities."²⁸ Kheifets, currently on ICNIRP's Standing Committee on Epidemiology and formerly manager of IEMFP (2001-2003), previously worked for many years at EPRI who paid her \$50,000 in 2005, while a member of ICNIRP, to write a review paper for a WHO workshop on EMF risks to children. Her paper supports EPRI's theory that discounts the observed link between childhood leukaemia and power frequency magnetic fields.²⁹ Other power industry representatives who assisted Kheifets on preparing the IEMFP Environmental Health Criteria (EHC) draft were Gabor Mezei, from the EPRI, Jack Sahl from Southern California Edison, USA, and Jack Swanson from the National Grid, UK. When Repacholi sent a draft of the EHC out for review in early July 2005, the reviewers included representatives from the power industry bodies: The Federation of Electric Power Companies of Japan, Pacificorp (USA), Hydro-Quebec (Canada), the Utility Health Sciences Group (USA) and Exponent Inc, (USA).³⁰

The question of possible liability was apparently on the agenda, as Exponent Inc has described its business activities as follows:

Exponent serves clients in automotive, aviation, chemical, construction, energy, government, health, insurance, manufacturing, technology and other sectors of the economy. Many of our engagements are initiated by lawyers or insurance companies, whose clients anticipate, or are engaged in, litigation over an alleged failure of their products, equipment or services.³¹

²⁶ *ibid.*

²⁷ L. Slesin, 'WHO and Electric Utilities: A Partnership on EMFs', *Microwave News*, Oct. 1, 2005.

<http://www.microwavenews.com/fromthefield.html#partners>, Accessed October 10, 2005.

²⁸ L. Kheifets, 'Letters, Childhood cancer and power lines', *British Medical Journal*, vol. 331, p. 634-638, Sept.17, 2005.

²⁹ L. Slesin, 'Money Talks and the WHO Follows', *Microwave News*, Aug. 8, 2005.

http://www.microwavenews.com/nc_aug2005.html, Accessed Sept. 12, 2005.

³⁰ *ibid.*

³¹ S. Bohme, *et al*, 'Maximizing Profit and Endangering Health: Corporate Strategies to Avoid Litigation and Regulation', *Int J Occup Environ Health*, vol. 11, No. 4, Oct./Dec. 2005, pp.338-348.

In addition to IEMFP staff, the only other observers that Repacholi invited to the IEMFP Task Group meeting in Geneva on 3 October to recommend exposure limits were eight representatives from the power industry. Members of the press were barred from attending.³² In addition the meeting was not publicised on either the IEMFP web site meetings list or the Bioelectromagnetics Society Newsletter's conference calendar and very few members of the EMF scientific community, including important EMF epidemiologists, were even aware of the meeting.³³ Only industry representatives received invitations. The epidemiologists who were directly involved in the research that the WHO's risk assessment task group would be reviewing were not invited as either observers or reviewers.

The *Microwave News* article points out that a number of independent researchers were involved in the preparation and review of the draft, but it was "highly unusual, if not unprecedented, for a WHO health document to be reviewed by so many with such strong ties to the affected industry."³⁴

One example of an industry reviewer's viewpoint, seeking to downplay potential health hazards, is seen in the comments from Michel Plante, representing Hydro-Quebec:

The whole section on cancer seems more like a desperate attempt to maintain some positive statistical association from epidemiological studies alive than a factual and honest presentation of arguments both, for and against, carcinogenicity.³⁵

Plante's role as a protector of his employer's interests in denying a cancer link with EMFs was amply demonstrated in his involvement, as a Hydro-Quebec representative, in suppressing potentially damaging cancer data in a 1994 Hydro-Quebec funded epidemiological study By Dr. Gilles Theriault *et al.* from McGill University. The initial analysis of the data collected from three electric utilities found that workers who had the greatest exposures to magnetic fields had twelve times the expected rate of astrocytomas, a type of brain tumour, based on a small number of cases.³⁶ In a later re-analysis of the data³⁷, this time looking at high frequency transients (HFT), the McGill University team found up to a 10-fold increased risk of developing lung cancer amongst highly exposed utility workers, with a "very clear" exposure-response relationship.³⁸ When Gilles Theriault's McGill team wanted to further analyse the HFT data for other associations, Hydro-Quebec, which funded the \$3 million study, and therefore owned the collected data, refused further access to the data. Plant said at the time that "[w]e have a contract problem that has to be resolved and there will be no new mandate until it is solved." Plante argued that by Theriault publishing the findings on HFT he had

³² Slesin, 'WHO Welcomes Electric Utility Industry...', 2005.

³³ *ibid.*

³⁴ *ibid.*

³⁵ *ibid.*

³⁶ G. Theriault, *et al.*, 'Cancer Risks Associated with Occupational Exposure to Magnetic Fields Among Electric Utility Workers in Ontario and Quebec, Canada, and France: 1970-1989', *American Journal of Epidemiology*, vol. 139, 1994, pp. 550-572.

³⁷ B. Armstrong, *et al.*, 'Association Between Exposure to Pulsed Electromagnetic Fields and Cancer in Electric Utility Workers in Quebec, Canada, and France', *American Journal of Epidemiology*, vol. 140, 1994, pp. 805-820.

³⁸ L. Slesin, 'Transients and Lung Cancer: A "Strong" Association and a "Remarkable" Exposure-Response', *Microwave News*, vol. 14, no. 6, Nov/Dec 1994, pp. 4-6.

violated the contract with the utilities. Many senior EMF researchers and epidemiologists saw the HFT data as having important implications and needing further analysis by other researchers.³⁹ As of June 2009 no further analysis of the Hydro-Quebec HFT data has been done as the data has been withheld from any further analysis from the scientific community by Hydro-Quebec. Plante, as Hydro-Quebec's representative at the centre of that suppression was asked by Repacholi in the 2005 WHO task group meeting to review the WHO's Environmental Health Criteria risk assessment. It is not known if Plante was asked at the meetings about the "positive statistical association" seen in the Hydro-Quebec HFT data but if this was asked one reply could have been that it was not important because it had not been replicated.

The Utility Health Sciences Group (UHSG), another power industry group that Repacholi asked to review the EHC draft document, plainly indicated that they considered increased costs to industry (a risk assessment cost/benefit consideration) should take precedence over health considerations when they proposed a change in the chapter on protective measures that stated:

It should also be pointed out that redirecting facilities or redesigning electrical systems may be so expensive as to be inconsistent with the low-cost and no-cost steps typically viewed as prudent avoidance.⁴⁰

UHSG also proposed a statement, possibly to ward off possible future litigation, to be included in the summary"

It would be useful for the summary to include a clear statement that the scientific research does not establish ELF EMF as a cause or contributing factor in any disease or adverse health effect, including cancer.⁴¹

As mentioned previously, the ICNIRP web site states that in order to protect its status as an independent advisory body, "ICNIRP as an organization does not accept funding from industry"⁴². When it comes to the WHO's International EMF Project, however, no such restrictions apply. Repacholi stated in 2004 that the "[EMF] Project can receive funding from any source through Royal Adelaide Hospital; an agency established through WHO Legal Department agreement to collect funds for the project."⁴³ Questions of a conflict-of-interest were raised when it was revealed by *Microwave News* that Repacholi, as head of the EMF Project, received \$150,000 annually from the cellphone industry.⁴⁴ However, Repacholi could rightfully still claim that he did not receive any direct funding from industry sources since it is channelled through the Royal Adelaide Hospital. This arrangement may be in violation of current WHO rule against employees and consultants accepting any "gift or remuneration" from external sources

³⁹ *ibid*

⁴⁰ Slesin, WHO and Electric Utilities: A Partnership..., 2005.

⁴¹ *ibid*.

⁴² ICNIRP, 'An Independent Voice...', 2007.

⁴³ M. Repacholi, Welcoming presentation, 9th International Advisory Committee (IAC) meeting, Istanbul Turkey, Jun. 7, 2004. http://www.who.int/entity/peh-emf/meetings/archive/en/repacholi_iac_welcome.pdf, Accessed Sept 14, 2005.

⁴⁴ Communication with Louis Slesin, editor of *Microwave News*, Nov. 21, 2005.

“incompatible” with their duties at WHO.⁴⁵ That was what Repacholi clearly stated to the Australian Senate Committee in May 2001 (as quoted previously). “There cannot be someone on the [IEMFP] working group who is having an influence on health effects for an industry when they derive benefit from that industry”

A questionable oversight committee

According to a fact sheet *New Electromagnetic Fields Exposure Guidelines* published by the European Commission in December 2005, an “International Advisory Committee” (IAC) has been set up to provide oversight to IEMFP. This committee consisted of representatives of international organizations, independent scientific institutions and national governments who are supporting the Project.⁴⁶ In this case IAC oversight should essentially operate much the same as judicial oversight where a judicial branch of the government watches or monitors what is going on or happening in a case or matter. In the judicial arena it is a form of checks and balances that operates to keep law officers from abusing their powers. In the case of the WHO’s EMF Project IAC oversight should operate to prevent WHO officials from abusing their powers - and this should include preventing officials, such as Repacholi, allowing Environmental Health Criteria risk assessments to be influenced by direct industry involvement in the process. It would also be important for the IAC to maintain an “arms-length” distance from the project activities that it is supposed to monitor.

The question then needs to be asked of the IAC: Why have they failed to intervene in the case of blatant industry influence on the WHO’s ELF/EMF Task Group? Perhaps the answer to that was partially given by Sociologist Sheila Jasanoff when she observed that most of the relevant literature suggested that when regulatory advisers became part of a hybrid socio-technical process, they tended to lose their authority as neutral experts.⁴⁷

Forgotten lessons: Big Tobacco and protecting the integrity of WHO decision making

In July 2000 the WHO Committee of Experts on Tobacco Industry Documents released a 260-page report detailing the tobacco industry’s strategies to undermine the work of the WHO.⁴⁸ At the same time the WHO issued a 15-page response document listing steps to ensure that the WHO was never undermined again. Just a few of the 58 recommendations were as follows:

#6. WHO should urge other UN organizations to investigate possible tobacco company influences on their decisions and programs, and to report their findings publicly.

7. WHO should advocate implementation and consistent enforcement of effective conflict of interest and ethics policies throughout UN agencies.

⁴⁵ G. Brundtland, ‘Response of WHO to the Report of the Committee of Experts on Tobacco Industry Documents’, WHO, June 10, 2000. http://www.feel-free.info/uploads/media/Document_14.pdf, Accessed Sept. 14, 2005.

⁴⁶ European Commission, ‘Science for Environment Policy, New Electromagnetic Fields Exposure Guidelines’, European Commission DG ENV, News Alert, issue 3, Dec. 2005.

⁴⁷ S. Jasanoff, *The Fifth Branch: Science Advisers as Policymakers*, Harvard University Press, 1990, p. 9.

⁴⁸ WHO, Tobacco Company Strategies to Undermine Tobacco Control Activities at the World Health Organization, Report of the Committee of Experts on Tobacco Industry Documents, July 2000. http://www.who.int/tobacco/policy/who_inquiry/en/print.html, Accessed Sept. 18, 2005.

#8. WHO should urge Member States to conduct their own investigations of possible tobacco company influence on national decisions and policies, and to publish reports on their findings."

#11: Appoint an ombudsman or other independent officers, outside the standard lines of reporting authority, with autonomy and clear authority for enforcing ethical rules.

#12. Disseminate conflict of interest rules more broadly.

14. Introduce a formal process for vetting prospective employees, consultants, advisers, and committee members, to identify conflicts of interest.

19. Prohibit employees, consultants, advisers, and committee members from holding any substantial financial affiliation with the tobacco industry, including any employee or consulting relationship. . . "

#20. Disqualify any professional services from performing work on behalf of WHO if the firm also provides a tobacco company with services likely to be adverse to the interest of public health. . . "

#21. Prohibit employees, consultants, advisers and committee members from accepting any item of value from a Tobacco company or its affiliates. . . "

*# 35. WHO and IARC should take steps to educate their scientific investigators and collaborators about tobacco company efforts to undermine research and the need for special vigilance in protecting the integrity of tobacco-related research."*⁴⁹

Although the above sampling of WHO recommendations was in response to Big Tobacco's attempts to undermine WHO integrity, it has direct relevance to other large industrial interests and cannot be ignored, be it the power or telecommunications industries. Unfortunately it seems that in this case at least, WHO has forgotten the hard lessons learnt with its previous experiences with Big Tobacco. In the case of WHO's Task Group writing the new Environmental Health Criteria (EHC) for power frequency EMFs, a violation of the above recommendations urgently calls for an independent evaluation to protect both public health and WHO's public credibility. Such a blatant disregard for both ICNIRP and IEMFP statements on remaining independent from industry influence in their RF guidelines and risk assessment processes undermines their scientific credibility, not only for powerfrequency risk assessment but for the whole range of their activities, including RF. What is apparent in this section is that essentially the problem is not so much of a conflict of interest but very much that there is a shared interest. An interest shared by IEMFP / ICNIRP and industry to maintain standards commensurate with the industry's requirements.

Setting the scene internationally

Through WHO, the ICNIRP Guidelines for RF/MW and ELF non-ionizing radiation exposure standards are being promoted globally to virtually every nation in an effort to

⁴⁹Brundtland, 2000.

make it a truly internationally accepted template for national standards. Chapter 5 examines the case for Australia, where the clear impetus for the introduction of ICNIRP's RF guideline limits was based on economic considerations so that new telecommunications technology could be legally sold in Australia without contravening the RF standard. The following few examples are only a brief sampling of this global effort. Though details vary according to the particular situation in each country, what remains constant is the promotion of the ICNIRP Guidelines as a global 'Gold Standard' that is based on sound science that is above reproach, or an 'unproblematic body of sure and certain knowledge', a viewpoint that this thesis takes issue with and which has been questioned by various national authorities as the following examines.

EU / CENELEC

The European Union has passed a recommendation which implements the ICNIRP guideline exposure limits, thereby harmonizing all EC countries' EMF standards with ICNIRP. In addition, the European Committee for Electrotechnical Standardisation (CENELEC), which is not an EC institution, produces EMF assessment standards for all electrical products that produce electromagnetic fields and are sold or imported into the EU. CENELEC now refers to the ICNIRP exposure levels in its compliance standards. The result is that any product, such as mobile phones or domestic appliances sold or imported into the EU, must comply with ICNIRP Guidelines.⁵⁰

Current former Eastern European countries that have, or had, the strict Russian RF standard and are now members of CENELEC are: the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Slovakia, Slovenia, and Poland. Albania, Bosnia/Herzegovina, Bulgaria, Croatia, Romania and Ukraine are currently 'affiliate members' with a view to becoming full members.⁵¹

The United Kingdom

In a press statement released on 31 March 2004, the United Kingdom's National Radiological Protection Board (NRPB) recommended the adoption of the ICNIRP Guidelines⁵². This recommendation followed advice from UK and international scientific experts and groups, including the UK's Advisory Group on Non-Ionizing Radiation (AGNIR).⁵³ The main difference between the previous NRPB RF limits and those of ICNIRP is that while the occupational limits are the same in both guidelines, for public exposure, ICNIRP limits are a factor of five lower⁵⁴ so in the U.K. context, ICNIRP's lower limits in comparison to the higher NRPB limits was simply taken as a precautionary approach as recommended by Sir William Stewart, chairman of the

⁵⁰ WHO, USAF, 'Electromagnetic Fields, Research, Health Effects, and Standards Harmonization', Asia-Pacific EMF Conference, Bangkok, Thailand, Jan. 26-30, 2004, p. 44, <http://www.bangkokemf.com>, Accessed Aug. 27, 2005.

⁵¹ CENELIC, 2007,

<http://www.cenelec.eu/Cenelec/About+CENELEC/Our+organization/CENELEC+Members/Default.htm>, Accessed Aug. 30, 2007.

⁵² NRPB, Statement by the National Radiological Protection Board. Advice on Limiting Exposure to Electromagnetic Fields (0 – 300 GHz). Doc. NRPB 15 (2) 2004. ISBN 0-85951-532-X, Available on NRPB website http://www.nrp.org/publications/documents_of_nrp/abstracts/absd15-2.htm, Accessed May 23, 2004.

⁵³ NRPB Press Release, Apr. 5, 2004, http://www.nrp.org/press/press_releases/2004/press_release_5_04.htm Accessed May 25, 2004.

⁵⁴ *ibid.*

Independent Expert Group on Mobile Phones (IEGMP) in 2000.⁵⁵ According to an April 5th 2004 press release by NRPB, "This new recommendation by NRPB to adopt ICNIRP Guidelines reflects a detailed assessment of the risks involved, and also the need for a precautionary approach when there are genuine uncertainties in our knowledge."⁵⁶ This viewpoint is in sharp contrast to the considered statements of members of the Australian TE/7 committee who rejected ICNIRP as failing to follow a precautionary approach (See Chapter 5). The difference was that in Australia, the ICNIRP limits were significantly higher than those of the old Australian standard so that accepting the ICNIRP limits would have meant a significant increase in the allowable limits from 200uW/cm² for the mobile phone frequencies of around 800-900 Mhz to 450 uW/cm².

The Russian Federation

At the international conference titled: *Mobile Communications and Health: Medical, Biological and Social Problems*, held in Moscow on September 20-22, 2004, both Paolo Vecchia and IEMFP head Repacholi promoted ICNIRP as the only choice for the Russian agencies if they wanted to live in a global community.⁵⁷ Repacholi spoke about one of the initiatives of the EMF Project as providing a framework for the harmonization of RF standards world-wide. This would include an international agreement on developing guidelines to provide protection of the public and workers from exposure to EMF. However, by the end of the conference it was obvious that "developing guidelines" would only be those developed by ICNIRP. Speaking on behalf of the Russian National Commission on Non-Ionizing Radiation Protection (RNCNIRP) Yuri Grigoriev stated on numerous occasions that ICNIRP's thermal effects criteria were not a suitable approach to providing health protection. Numerous papers were given from a range of Russian organizations that claimed to find adverse biological effects at levels far less than ICNIRP's thermal only limits. All of the Russian organizations present at the conference, including the Russian Academy of Science and the Russian Academy of Medical Science, were of the firm opinion that Russia's low level non-thermally based RF standard was the preferred way to provide health protection. They considered that ICNIRP's thermal effects only approach was not protective of workers and the public as it did not take into account possible long-term, low-level adverse biological effects, including immunological from RF exposure.⁵⁸ Yuri Grigoriev said that ICNIRP's "thermal effects for criteria or standards is not a suitable approach" and that the WHO was being "insufficient on the precautionary principle."⁵⁹

The dilemma facing the Russian scientific community is that while their citizens are rapidly embracing the whole range of available telecommunications technology, much of that technology is technically illegal in Russia as the emission levels are in excess of the allowable exposure limits in the Russian standard. This was pointed out to the chairman of the RNCNIRP, Yuri Grigoriev, at the Moscow conference by Michael Repacholi, who said: "What is the use of the Russian Standards if the millions of phones

⁵⁵ IEGMP, *Mobile Phones and Health*, report of the Independent Expert Group on Mobile Phones, 2000, p. 110 – 113.

⁵⁶ NRPB Press Release, 2004.

⁵⁷ D. Maisch, 'Report on the International Conference: 'Mobile Communications and Health: Medical, Biological and Social Problems'', Sept 20-22, 2004, Moscow, Russia, *European Biology and Bioelectromagnetics*, vol. 1, issue 1, Jan. 2005.

⁵⁸ *ibid.*, p. 2.

⁵⁹ *ibid.*, p. 3.

sold in Russia met the ICNIRP Guidelines but not the Russian ones?" Repacholi added, "How can you tell the public to give up their phones because they are in excess of the [Russian] standard?"⁶⁰ This situation forces the Russian scientists into a no-win situation. The economically rational option would be to simply adopt ICNIRP's thermal only philosophy and join the Repacholi's international club. However, for the Russian scientists involved, to retreat from their strict RF standards and adopt the ICNIRP thermal effects only philosophy would be to admit that their science on providing health protection from RF exposure was wrong and thus their entire scientific literature base and credibility, built up over half a century, was worthless. Another pressure on Russian scientists according to Vladimir Binhi, one of the Moscow conference organizers and member of RNCNIRP, was that acquiescing to ICNIRP was being presented to the Russian government as a requirement for being accepted as a member of the World Trade Organization (WTO).⁶¹ This was in agreement with Repacholi who said at a January 2004 conference in Thailand that a WTO requirement for all countries who are a signatory to the General Agreement on Tariffs and Trade (GATT) was to harmonize with international standards.⁶² As of June 2005, Russia was in conflict with the WTO over the many terms of membership with the organization⁶³ and as of August 2008 still has not joined the WTO⁶⁴. RNCNIRP chairman Grigoriev summed up the problem for the Russian Federation RF standard setting body when he mentioned that modern telecommunications might inherently be incompatible with adequate health protection.⁶⁵

As stated at the Moscow conference by Repacholi, the WHO's statement on RF health effects is the following:

Hazards of exposure to high levels of RF fields, which result in tissue heating, are basically understood and form the basis for current international standards (ICNIRP, 1998). Thermal hazards are associated with acute exposures and are thought to be characterised by threshold exposures, below which no health effects occur. There is no confirmed evidence that exposure to RF fields has any long-term health consequences.⁶⁶

Repacholi also commented that national RF limits should not be lower than the ICNIRP exposure standards. In support of Repacholi, ICNIRP Chairman Paolo Vecchia said in his presentation that:

Only solid science is taken into consideration in setting guidelines: quality of study and consideration of results... ICNIRP only considers acute effects [thermal] in its precautionary principle approach. Consideration of long-term effects [is] not possible.⁶⁷

⁶⁰ *ibid.*, p. 8.

⁶¹ Correspondence with Vladimir Binhi, Oct. 23, 2004.

⁶² M. Repacholi, 'WHO Framework for Developing EMF Standards', Asia Pacific EMF Conference, Electromagnetic Fields, Research, Health Effects, and Standards Harmonization, Bangkok, Thailand, page 46, Jan., 2004, p. 46.

⁶³ No author, 'Russia comes into serious crisis with its WTO membership talks', *Pravda*, Jun. 29, 2005. http://www.english.pravda.ru/main/18/89/356/15722_WTO.html Accessed Aug. 18, 2005.

⁶⁴ A. Smolchenko, 'Putin casts doubt on Russia's WTO accession', *The Moscow Times*, Aug. 25, 2008. <http://www.iht.com/articles/2008/08/25/business/wto.php>, Accessed Sept. 10, 2008

⁶⁵ Correspondence with Yuri Grigoriev, Chairman of RNCNIRP, Sept. 21, 2004.

⁶⁶ Maisch, 2005, *op. cit.* p. 6.

⁶⁷ *ibid.*, p. 7.

As for a precautionary approach in the ICNIRP Guidelines Vecchia stated that:

Precautionary actions to address public concerns may increase rather than mitigate worries and fears of the public. This constitutes a health detriment and should be prevented as other adverse effects of EMF.⁶⁸

As of October 2008 the strict Russian RF standard is still in place with the thermal rationale for the ICNIRP Guidelines still being rejected by RNCNIRP. This can be seen in RNCNIRP's precautionary advice, issued on April 14, 2008, that people under the age of 18 should not use mobile phones in order to protect children's health from possible negative influences from mobile phone emissions.⁶⁹ At an IEEE standards meeting in San Antonio, Texas in December 2005, C-K Chow from Motorola mentioned that the Russians were "still behind in their thinking regarding an appropriate metric for establishing limits." John D'Andrea from the U.S. Naval Health Research agreed and added that, "it will be a long time before the old guard is gone and there is a change in philosophy in Russia".⁷⁰

China

China, like the Russian Federation, has established far stricter RF standards than those of ICNIRP (or IEEE C95.1), based on research indicating adverse biological effects other than just tissue heating. As a result of their research, China has long had one of the world's strictest standards for exposures to microwave radiation for both the public and workers.⁷¹ China, like Russia, has been pressured by a number of groups, including WHO and Motorola, to heed WHO's advice and adopt the ICNIRP Guidelines for its RF exposure standard.⁷² For example, a major focus of the Third International EMF Seminar, held in Guilin, China, in October 2003, was international standards harmonization.⁷³ Michael Repacholi, representing the WHO's International EMF Project (and one of the sponsors of the Seminar) and Bernard Veyret, representing ICNIRP, were pushing for ICNIRP to be accepted by China's Standardization Administration. Repacholi's position was that as China was a member of the WTO it had to abide by the WHO requirement to apply ICNIRP limits, such as the 2 watt/kg SAR limit for mobile phones.⁷⁴ Repacholi's WTO argument was rejected by the Chinese RF standards agency people and at the Guilin seminar when they outlined their draft standard that halved ICNIRP's maximum

⁶⁸ *ibid.*

⁶⁹ RNCNIRP, 'Children and Mobile Phones: The Health of the Following Generations is in Danger', RNCNIRP, Apr. 14, 2008, http://www.emfacts.com/papers/rncnirp_children.pdf, Accessed Sept. 4, 2008.

⁷⁰ IEEE/ICES TC95 Subcommittee 4, Approved Minutes, San Antonio, Texas, Dec. 10, 2004, p. 3. http://www.ices-emfsafety.org/documents/Minutes/TC95_december%202005%20minutes.pdf, Accessed Apr. 28, 2006.

⁷¹ L. Slesin, 'China Weighs 1 W/Kg SAR Limit for Mobile Phones', *Microwave News*, vol. 22 no. 3, May/June 2002, p. 6.

⁷² Motorola, 'Motorola fact sheet, China Standard', July 2003. <http://www.motorola.com/content/0,,2387-5025,00.html>, Accessed Aug. 18, 2004.

⁷³ M. Swicord, 'Third EMF Seminar in China a Success', *Bioelectromagnetics Newsletter*, no. 174, Sept./Oct. 2003, pp. 8-9.

⁷⁴ Interfax News Agency [no author], 'China Considers Setting New Cell Phone Radiation Standards', China, Oct. 20, 2003, http://www.buergewelle.de/body_emf_omega-news_24-10-03.html, Accessed Aug. 18, 2005.

cell phone specific absorption rate of 2 W/kg over 10 grams of tissue to 1 W/kg per 10 grams of tissue. As an additional precaution, China proposed to require all handsets to reduce their RF emissions after 2 hours of steady use. For base stations the draft standard proposed reducing emissions from broadcast facilities to a quarter of ICNIRP limits.⁷⁵

At the Seminar, Hui Chiang of the Bioelectromagnetics Laboratory at Zhejiang University, Hangzhou, stressed that the public health significance of EMFs had been underestimated in China. Chiang also reviewed the rationale for China's strict EMF standards. In response to Repacholi's and Veyret's suggestion that China should consider joining Europe and much of the international community by accepting ICNIRP's exposure guidelines, Dr. Chiang replied in the negative.⁷⁶ In her review of the Chinese research Chiang said that after a wide-ranging review of the relevant studies useful for an RF health risk assessment, there were so many inconsistent experimental results pointing to "many reports of nonthermal potential health effects," plus important questions about the limitations of using SAR in standard setting. Chiang saw "growing evidence that magnetic fields penetrate cells, tissues and may cause bioeffects by themselves" (not just ICNIRP's induced current criteria for ELF fields) and as such, "it would be too much to expect China to adopt the ICNIRP Guidelines at this point."⁷⁷ In a paper presented at a Korean conference in 2001, Chiang wrote that the ICNIRP limits "are based on short-term, immediate health effects," but that "there is a body of literature which suggests that biological effects can be shown at levels of radiation which do not produce heating or stimulation."⁷⁸

Unlike Russia, where cell phones and other wireless technology have essentially been proliferating without consideration of the strict standards and effectively making their standards irrelevant, China's insistence on lower cell phone standards has forced overseas manufacturers to customise their phones to Chinese regulations. The reason for this flexibility is economic - China potentially represents almost a third of the world market.⁷⁹ For this reason representatives from both Lucent and Motorola have been mentioning to the Chinese the vast financial opportunities waiting for them⁸⁰ as soon as they change their strict standard to conform to ICNIRP's.⁸¹

The basic consideration in Chinese RF standards is an assessment of health hazards based primarily on observations on the health status of personnel exposed to RF fields. Investigations on the health effects of occupational and environmental exposures to differing frequencies found that chronic exposure to RF (and ELF) are associated with a variety of non-specific symptoms, including increased frequency of neuroses, adverse effects on the nervous system and changes in peripheral blood, lens, and non-specific immune function. The threshold for such effects in the RF range (over 30 MHz) is in the

⁷⁵ IEEE Spectrum [no author], 'China May Draw a Sharp Lower Line on Mobile Phone Radiation', *IEEE Spectrum*, Aug. 13, 2002.

⁷⁶ Swicord, 2003.

⁷⁷ *ibid.*

⁷⁸ Slesin, 'China Weighs 1 W/Kg SAR Limit...', 2002, *op. cit.*, p. 7.

⁷⁹ IEEE Spectrum, 2002.

⁸⁰ One example mentioned was rebuilding cell phones and cell phone batteries.

⁸¹ Correspondence (confidential) with IEEE SCC-28 committee member, Aug. 25, 2005.

range of 50 –200 $\mu\text{W}/\text{cm}^2$, well below the ICNIRP limits.⁸² The current Chinese RF exposure standards were set up in 1988 and 1989 and based on a Chinese Tentative Standard from 1981. However, as stated in a paper by Chiang and Zhejiang Xu, at the 2003 Guilin Seminar, “because of the new and rapid development of telecommunication facilities, the economic globalization, and the need for standard harmonization, a draft of an amended EMF exposure standards was proposed by an United Working Group in China”.⁸³ The draft Chinese RF standard covered the entire frequency ranges of the ICNIRP Guidelines. Also, like in the ICNIRP Guidelines there are two classes, i.e. basic (preliminary) restrictions and reference levels (exposure limits), and the basic restrictions are current density (for electric field only), SAR, and power density. Two tier standards, i.e. occupational and general public, are also adopted but at levels less than those of ICNIRP. The reasons stated in the draft standard for the stricter levels are as follows (for RF exposures):

- The ICNIRP Guidelines are based on short-term, immediate health effects (heating) whereas there is a body of literature which reports that health effects can be shown at a level of radiation that does not produce heating.
- SAR thresholds of behaviour-disruption have been observed at levels much lower than ICNIRP’s 4 W/kg basic restriction level.
- There are a number of animal studies showing immune system effects from RF/MW exposure in SAR levels far lower than ICNIRP’s 4 W/kg basic restriction. In addition changes in immune system function were observed in humans exposed to environmental low-level RF radiation.
- For *in-vitro* studies, the evidence of RF non-thermal bioeffects is increasing.
- In summary, there are many reports on non-thermal potential health effects from microwave radiation. The SAR threshold for the adverse effects in the frequency range from 100 kHz to 10 GHz may be at 0.5 to 1.0 W/kg, rather than ICNIRP’s 4.0 W/kg threshold.
- SAR is a valid measure of energy absorption rate during RF exposure, but not a quantity indicator of biological effects. Examples given were the significantly differing bioeffects observed between continuous and intermittent RF exposure, between modulated and unmodulated microwave exposure at the same SAR level. For this reason the Chinese question using SAR as a basic restriction.
- Considering the above, the Chinese standard setting working party chose a whole body average SAR of 0.1 W/kg as the restriction for occupational exposure, and 0.02 W/kg for the general public.
- For cell phones the localised SAR for the head and trunk is restricted to 1.0W/kg averaged over 10 g of tissue.⁸⁴

Huai Chiang concluded at the 2003 Seminar at Guilin:

The present knowledge in assessment of possible health effects related to exposure to EMF has not provided a sufficient rationale to establish satisfactory and general

⁸² H. Chiang, Z. Xu, Discussion on Rationale for China EMF Exposure Standards, Bioelectromagnetics Lab, Zhejiang University School of Medicine, Hangzhou 310031, China, 3rd International EMF Seminar in China, 13-17 Oct. 2003.

⁸³ *ibid.*

⁸⁴ *ibid.*

acceptable exposure limits yet, though there are growing evidences of highly potential health effects from EMF exposure. The draft of the amending exposure standard in China is still questionable and far from perfect, but it is reasonable and has scientific basis. As the scientific advances, including the rapid development of molecular biology with powerful techniques and adoption of novel concepts, researchers may settle many arguments about the health effects of EMFs. However, the exposure standards are aimed at protecting people, and the development of electricity and communication are of great benefit to people, a general acceptable and practical exposure standard should be produced after taking cost and benefit analyses with precautionary principle.⁸⁵

In response to Chiang, Repacholi asked the Chinese Standards committee to provide a scientific rationale for their standard when it was finalised so everyone in the world would know what was the basis for the Chinese standard. He said that this would be very important for the harmonization of standards around the world.⁸⁶ According to Chiang at the 4th EMF Bioeffects Seminar, held in Kunming, China in Sept 2005, the Chinese delegation still had not agreed to use the ICNIRP Guidelines.⁸⁷

At an IEEE standards meeting in San Antonio, Texas in December 2005, C-K Chou from Motorola was asked if China would adopt the IEEE's C95.1 RF limits. Chou replied that so far China has only adopted the basic restriction specifically for cell phones, i.e., 2 W/kg averaged over 10 grams of tissue. This relaxation was because China already has over 350 million citizens using mobile phones. Other issues, such as MPEs and other basic restrictions were not agreed to.⁸⁸

The Czech Republic

Like Russia and China, the Czech Republic (formerly part of Czechoslovakia) for many years maintained a strict RF/MW exposure standard for both the public and workers. In collaboration with Soviet scientists, Czechoslovakia had conducted much of the research on the bioeffects of RF exposure, both thermal and non-thermal, and their standard was based on eliminating both these effects. This research was conducted at the Institute of Industrial Hygiene and Occupational Diseases and the Occupational Diseases Clinic in Bratislava and in both research laboratories a wide range of non thermal bioeffects were found that reinforced their strict RF standard.⁸⁹ However, in January 2001, the Czech Republic replaced its former strict Soviet based COMECOM⁹⁰ RF limits with much relaxed limits based on the ICNIRP Guidelines. The reason for the change was an apparent political decision made in favour of economic considerations against the expert

⁸⁵ *ibid.*

⁸⁶ WHO, 3rd International EMF Seminar in China, 2003, Meeting Summary, <http://www.who.int/peh-emf/meetings/archive/en/china03mtgsummary.pdf>, Accessed Aug. 24, 2005.

⁸⁷ Correspondence with Professor Huai Chiang, Sept. 26, 2005.

⁸⁸ IEEE/ICES TC95 Subcommittee 4, 2005.

⁸⁹ K. Marha, J. Musil, *Electromagnetic Fields and the Life Environment*, Institute of Industrial and Occupational Diseases, Prague, English publisher San Francisco Press, 1971.

⁹⁰ A. Uegaki, 'Russian Federation's Foreign Economic Relations', Economic and Social Research Institute, Mar. 2001, www.esri.go.jp/en/tie/russia/russia5-e.pdf, Accessed Aug. 17, 2005. NOTE: Under the Soviet system, internal trade agreements and standards were conducted through COMECOM, the Soviet Union-led trading system. After the fall of the Soviet Union, COMECOM tended to be seen by former member states as a hold over from the old Soviet system.

advice of the Czech National Institute of Public Health's Advisory Board on Non-Ionizing Radiation.

Dr. Jan Musil⁹¹, chair of the Czech Republic's National Institute of Public Health's Advisory Board on Non-Ionizing Radiation had opposed the adoption of the ICNIRP limits. In early 2000, on behalf of the ten member board, Dr. Musil sent a statement to the US based publication *Microwave News* expressing concerns that the WHO had failed to apply the precautionary principle adequately in its evaluation of EMFs. Musil also asserted that the 1999 EU Council of Ministers recommendations to accept ICNIRP limits ignored the opinion of the European Parliament that ICNIRP's "basic restrictions" adopted by the council "include large safety factors only with respect to the thresholds for acute effects." The statement went on to say:

Emphasis on the need for more caution in words only, without introducing more stringent limits for chronic exposure in numerical form, can be intended only for an ideal world with ideal people. The Italian and Swiss governments are taking a more practical approach to real-world situations, with stringent limits for long-term exposure. We also welcome the concerns expressed last year by the U.S. government's Radiofrequency Interagency Work Group on the revision of the ANSI/IEEE RF/MW exposure standard. We refer particularly to the sections on acute and chronic exposures...on pulsed or frequency-modulated RF radiation ("Exposure guidelines based on thermal effects...and concepts...that mask any differences between intensity-modulated RF radiation exposure and CW exposure...may not adequately protect the public") and on time averaging (The 0.1 hour approach historically used should be reassessed.)."⁹²

In an open letter to colleagues around the world, Dr. Musil explained that he opposed the adoption of ICNIRP Guidelines and that he had been removed as the chair of both the National Reference Laboratory and the Advisory Board on Non-Ionizing Radiation. Dr. Musil said that he "was replaced by a person with no research experience in this area, who was willing to accept ICNIRP limits without biophysical qualification." Musil stated that he was against the "hurried harmonization of standards without objective verification of the facts."⁹³

From the viewpoint of the Czech government they had to respond to the economic dilemma also faced by the Russian Federation with their strict RF limits. These very low limits, especially for long-term exposure of general public, were introduced in the country in early seventies and re affirmed by the Czech ministry in 1990. However, with the rapid rollout of new wireless technology, difficulties in conforming to these limits soon appeared. In one case, TV and FM transmitters installed on a new TV tower in Prague were not allowed to broadcast for several months, as the limit for 24 hours resident exposure (0.01 W/m² for the frequency range 30 MHz to 300 MHz) was slightly violated on a nearby square, and the ban was lifted only after the power radiated by these transmitters was lowered. With the introduction of mobile phones in the 1990's it became apparent that emissions from mobile phone technology violated the maximum

⁹¹ Dr. Musil is co-author of *Electromagnetic Fields and the Life Environment*, 1971.

⁹² L. Slesin, 'Czech Panel on the Precautionary Principle and Numerical Limits', *Microwave News*, vol 20, no. 3, May/Jun. 2000, p. 14.

⁹³ L. Slesin, 'Czech Government Now Follows ICNIRP', *Microwave News*, vol. 21, no.1, Jan./Feb. 2001, p. 7.

power densities allowed by the 1990 regulations, making the use of the technology technically illegal.⁹⁴ Thus the conclusion that can be drawn from the Czech experience is that the government's decision to adopt ICNIRP was not based on a balanced assessment of the scientific literature but more on economic and military considerations with Musil and his committee's expert advice sacrificed for the sake of ICNIRP harmonization. Another factor in the Czech Republic moving away from its previous strict RF standard would be a popular desire to move away from conformity to dominant Soviet perspectives during the Cold War era, even though much of the research had in fact been conducted by Czech scientists. An unintended consequence of this, however, is the likely introduction of high power US military radar on Czech territory that conforms to ICNIRP RF standard limits. Under the former Czech national standard this introduction would have been illegal. In addition this has made the proposed Czech radar sites a potential nuclear target for Russia.⁹⁵

The military dimension of harmonization : The Asia-Pacific 2004 EMF Conference

Besides IEGMP, ICNIRP and the telecommunications industry having a big stake in promoting global RF standard harmonization, a brief examination of the January 2004 Asia-Pacific EMF Conference titled: *"Electromagnetic Fields, Research, Health Effects, and Standards Harmonization"*, in Bangkok, Thailand, is illustrative of the heavy involvement of the U.S. military in pushing the harmonization line for its own purposes. One of the objectives of the conference was to summarise a framework for the harmonization of international EMF exposure standards and present and discuss a model for EMF exposure regulation and compliance. The conference was organized by the WHO's International EMF Project (IEMFP), the U.S. Air Force Research Laboratory -Directed Energy Bioeffects Division - Radio Frequency Radiation Branch, at Brooks City-Base, Texas and the Ministry of Public Health, Thailand. Out of the 11 member International Organizing Committee, 8 members represented various sectors of the US Air Force, these being the Asian Office of Aerospace Research and Development (AOARD), which is a foreign detachment of the U.S. Air Force Office of Scientific Research⁹⁶ ; the European Office of Aerospace Research and Development (EOARD), a sister office to AOARD with its areas of interest being Europe, the mid-East, Africa, and countries of the former Soviet Union⁹⁷; the Air Force Research Laboratory at Brooks City-Base, Texas and "Advance Information Systems, Inc", also located at the Brooks City-Base, Texas. The three non-military representatives were Michael Repacholi (WHO), a member from the Ministry of Public Health, Thailand, as well as a representative from Health Canada.⁹⁸ Of the three editors of the proceedings of the conference, two were from Advanced Information Engineering Services, Inc, Brooks City-Base, Texas, one from Air

⁹⁴ L. Pekarek, Our experiences with introducing ICNIRP Guidelines, http://www.forum.europa.eu.int/.../jrc/jrc_eis_emf/library?l=/preliminary_country/czech_republicdoc/EN_1.0_&a=d , Accessed Aug. 17, 2005.

⁹⁵ J. Neoral, The anti-missile shield cannot defend the Czech Republic, Trokavec against the radar (A Czech web site opposing the introduction of US military early warning radar systems.) <http://www.trokavec.cz/en/about-the-radar/articles-about-the-radar/the-anti-missile-shield-cannot-defend-the-czech-republic>, Accessed Sept. 28, 2008.

⁹⁶ AFOSR fact sheet, <http://www.tokyo.afosr.af.mil/aboutaoard.html> , Accessed Aug. 26, 2005.

⁹⁷ *ibid.*

⁹⁸ WHO, USAF, Min. Pub. Health, Thailand, 'Electromagnetic Fields, Research, Health Effects, and Standards Harmonization', Asia-Pacific EMF Conference, Bangkok, Thailand, Jan. 26-30, 2004, p. 44, http://www.who.int/peh-emf/meetings/archive/en/bangkok04_proceedings.pdf, Accessed Aug. 27, 2005.

Force Research Laboratory, Brooks City-Base and the person in charge of the proceedings website from the Air Force contractor, General Dynamics.⁹⁹

The US Air Force has a very important reason to be actively involved in the world harmonization process. The U.S. has long been maintaining an interlocking web on overseas bases that supports U.S. objectives for securing access to markets, and obtaining natural resources, especially oil.¹⁰⁰ As part of a new strategy, many of the old massive bases dotted around the world are being replaced by a global network of what the Pentagon planners call “lily pads” – small forward bases in remote, dangerous corners of the world that can act as jumping-off points when crises arise.¹⁰¹ In the past couple of years, US bases have been established in the former Soviet republics of Kyrgyzstan, Uzbekistan and Tajikistan, and in former Eastern Bloc states, Bulgaria and Romania.¹⁰² This presence has increased tensions between these nations and Russia who has asked these countries to ask the U.S. forces to leave.¹⁰³ With Russia, China and other former Eastern block nations having strict RF standards, the very existence of these standards can act as an impediment to global deployment of U.S. bases as RF/MW emissions of US military radar equipment would in all probability be in excess of stricter national RF limits, in nations where they apply. This could cause local public opposition to the bases if it were known and could be used as an excuse for governments to ask the bases to leave. From the U.S. military point of view, as well as civilian contractors who manufacture their equipment, it would be far better to simply have just one global RF standard that was high enough to make the maximum military use of the RF spectrum possible, without the embarrassment of violating someone’s RF standard. ICNIRP limits, as well as the U.S. IEEE C-95 RF standard, conveniently meet that requirement, at least at the moment.

A brief run-down on some of the conference presentations relevant to RF standards and international harmonization illustrates that despite some concerns being raised over low-level biological effects from RF exposures there is an unquestioned acceptance of the two RF standards, ICNIRP and IEEE C95.1, to meet their various requirements.

1) C-K Chou from Motorola said that the weight of the evidence continues to support the IEEE C95.1-1991 RF standard’s 4 W/kg threshold level for potentially adverse health effects for short-term exposures of animals and that more than 50 years of research has shown that thermal effects are the only established adverse effects for fields above 100 kHz. Nonthermal RF bioeffects have not been established and none of the reported nonthermal effects are proven adverse to health. The IEEE C95.6-2002 standard established safety limits to protect against recognized short-term effects. IEEE found insufficient evidence of adverse effects from exposures found in community or occupational environments, and no confirmed mechanism to support the existence of such effects, including cancer.¹⁰⁴ A Motorola presentation on the final day of the

⁹⁹ *ibid.*

¹⁰⁰ J. Lindsay-Poland, ‘U.S. Military Bases in Latin America and the Caribbean’, *Foreign Policy in Focus*, vol. 9, no. 3, Aug. 2004, <http://www.fpif.org/briefs/vol9/v9n03latammil.html>, Accessed Aug. 26, 2005.

¹⁰¹ M. Mainville, U.S. Bases Overseas Show New Strategy, July 26, 2004, GlobalSecurity.org. <http://www.globalsecurity.org/org/news/2004/040726-us-bases.htm>, Accessed Aug. 26, 2005.

¹⁰² C. Ferguson, ‘Bait and Switch: Is Anti-North Korean Missile Defense Designed for China?’, *Journal of the Federation of American Scientists* (FAS) vol. 52, no. 6, Nov./Dec. 1999.

¹⁰³ Mainville, 2004.

¹⁰⁴ WHO, USAF, Min. Pub. Health, Thailand, Asia-Pacific EMF Conference, 2004, *op. cit.*, p. 20.

conference by Swicord, Morrissey, Elder and Chou reviewed the epidemiological evidence and called for public health officials to “bring closure to public health related questions as rapidly as possible.” They concluded that the question of how much research is necessary has to be answered from a public health perspective and not from interests of researchers.¹⁰⁵ In other words, thermal adverse effects from RF exposure are the only issue from a public health perspective. As IEEE C95.6-2002 and ICNIRP provides public health protection from these effects, Motorola considered that there was no need to waste efforts in conducting any further research on possible nonthermal effects as they are not proven adverse to health, if they exist at all. In essence an ‘end of history’ for EMF research.

2) The presentation of the manager of Nokia’s Bioelectromagnetics Research Centre, Sakari Lang, supported Motorola’s line and claimed that most of the approximately 1,300 studies on the IEEE’s database that are listed on the WHO web site are directly relevant to the issues of whether low-level exposure to RF energy can initiate or promote cancers. Sakari said that the “weight of evidence approach” shows that mobile phones and base stations cannot be linked to adverse health effects in humans and there is no established data supporting frequency specific or modulation specific health (non-thermal) effects.¹⁰⁶

3) John A D’ Andrea from the Naval Health Research Centre Detachment, Brooks City-Base, expressed a far less extreme view on the RF literature base than that of the Motorola and Nokia presenters. He agreed that at high RF power densities thermal effects are prevalent and can lead to adverse consequences. D’ Andrea added however that “on the other hand, some results have been found which suggests EMFs at low-power levels can alter biological systems especially following long-term exposures. There are a variety of reports of low-level exposures producing negative effects on the nervous system, visual system, cardiovascular system and cellular regulation and proliferation.”¹⁰⁷

4) Michael Murphy from the Directed Energy Bioeffects Division, Human Effectiveness Directorate, Air Force Research Laboratory, said that contemporary military activities employ extensive RF emitting equipment that results in some human exposure to low-level RF fields, often for long periods of time. He stated that some of the activities of his Division were to assess the risks from RF exposures and determine and mitigate the potential RF hazards to personnel health, safety and job performance. The overall mission was to support the maximum safe use of the RF spectrum and the setting of scientifically based health and safety standards.¹⁰⁸

5) Dr. Michael Repacholi (WHO) gave a run-down on the WHO’s International EMF Project, concluding that the WHO has determined that EMF exposures below the ICNIRP limits did not appear to have any known consequences on health. Repacholi added that that if precautionary measures were introduced, he recommended that they be voluntary, and that health-based exposure limits be mandated to protect public

¹⁰⁵ *ibid*, p. 66.

¹⁰⁶ *ibid*, p. 57.

¹⁰⁷ *ibid*, p. 22.

¹⁰⁸ *ibid*, p. 27.

health.¹⁰⁹ In a later presentation by Repacholi and Emilie van Deventer, also representing WHO, they acknowledged that since protecting populations was part of the political process it was to be expected that different countries, in responding to their citizen's wishes, may provide different levels of protection against environmental hazards. Differences can arise from different interpretations of the scientific data, from different philosophies for public health standards development and deficiencies in communications between scientists in different regions. According to Repacholi and van Deventer, however, differences can increase public anxiety which is further exacerbated by the introduction of new technologies, which are often associated with increased EMF exposure.¹¹⁰

6) In a presentation by various members of the IEEE C95.1 standards committee that explained the status of the standard revision it was mentioned that the peak spatial-average SAR limits were proposed to harmonize with those of ICNIRP.¹¹¹ Though not mentioned by the presenters, this is a significant relaxation of the US standard for mobile phones as the averaging volume goes from that holding 1 gram of tissue to 10. This move was most likely due to the fact that some of the mobile phones sold in the U.S. were out of compliance with the IEEE C94.1 –1991 standard because of the 1-gram averaging weight¹¹². Increasing it to 10 grams would effectively eliminate the non-compliance issue. The speakers concluded that their goal was to develop “scientifically based exposure limits that protect against known adverse effects with an adequate safety margin”.¹¹³

7) Dr. Peter Gajsek from the Institute of Non-Ionizing Radiation in Slovenia, a former state of the Soviet Union, gave a talk on the pressures of harmonization now facing the Eastern European (EE) countries who have carried on with the strict Soviet era RF standard. Gajsek explained how over the past 10 years, new political and economic situations in the Eastern European countries have dramatically changed international relations with many of the EE countries. New, democratically elected governments are looking outwards and joining the European Union (EU) and NATO and adapting their regulations and standards to suit. Therefore, both EMF standards and legislation in the EE countries are a subject for harmonization with EU legislation for both civilian and NATO standardisation for military purposes. Gajsek saw this as the first step in a long-lasting process of the global harmonization of EMF standards.¹¹⁴

8) David Black's presentation was titled “Australasian Standards and the Precautionary Principle”. Black briefly ran through his version of the failure of TE/7 to accept the ICNIRP limit revised standard in the 1990's, the subsequent approval of the standard for New Zealand after the incorporation of what Black called precautionary approach provisions which resulted in “stabilisation of RF deployment” in N.Z. Black said that after TE/7 failure ARPANSA then took over the task with a “wide ranging consultative process”¹¹⁵ He then claimed that the new Australian and New Zealand RF standards

¹⁰⁹ *ibid.*, p. 33.

¹¹⁰ *ibid.*, p. 46.

¹¹¹ *ibid.*, p. 35.

¹¹² Kane R, *Cellular Telephone Russian Roulette: A Historical and Scientific Perspective*, Vantage Press, New York, 2001, pp. 10-15.

¹¹³ WHO, USAF, Min. Pub. Health, Thailand, Asia-Pacific EMF Conference, *op. cit.*, p. 35.

¹¹⁴ *ibid.*, p.43.

¹¹⁵ This process did not include the majority of TE/7 members who had earlier voted against the ICNIRP Guidelines.

incorporated “recommendations for precaution”, while retaining the basic restrictions recommended by ICNIRP and were consistent with other international standards [IEEE C-95].¹¹⁶

9) In contrast to the above speakers the presentation by Huai Chiang and Zhengping Xu from the Bioelectromagnetics Lab, Zhejiang University School of Medicine, China, saw significant inadequacies in the ICNIRP approach to health protection. Chiang and Xu explained the main differences between ICNIRP and the Chinese RF standard. They saw ICNIRP as based on short-term, immediate health effects such as stimulation of peripheral nerves and muscles [for ELF] and elevated tissue temperature resulting from absorption of energy during exposure to RF/MW. They said, however, that the Chinese research base consisted of a growing body of literature which reported health effects down to such a level that did not produce heating or stimulation. They then outlined the rationale for China’s draft EMF standard that, although making some concessions to accommodate the ICNIRP limits, still retained stricter exposure limits.¹¹⁷

What the 2004 Asia-Pacific EMF Conference amply illustrates is the intense involvement of the U.S. Department of Defense, primarily through the Air Force, in determining the scope of RF standard setting in both IEEE C95.1 and ICNIRP. Although historically this was bound up with fears of a Soviet nuclear threat, as examined in Chapter 3, its current involvement seems to be more to ensure that the RF standard (C95.1 or ICNIRP) would never be in a position to threaten the viability of U.S. military radar tracking technology. This technology includes advanced early warning radar systems that are a vital part of the DoD’s National Missile Defense (NMD) program and its international deployment as the advanced Theater Missile Defense (TMD) system aimed at the so-called rogue states such as North Korea and Iran. A TMD system in Taiwan is also apparently designed to counter possible Chinese missiles.¹¹⁸ According to 2008 military budget figures the NMD program is DoD’s single biggest program development budget with \$8.8 billion allocated for that year alone.¹¹⁹ Central to the development of the NMD program (including TMD) is the development and deployment of Ground Based Radar (GBR), including Upgraded Early Warning Radar (UEWR) facilities and new high-resolution X-Band Radars (XBRs). The corporate partners developing these systems for DoD work through the United Missile Defense Company (UMDC), a joint venture equally owned by Lockheed Martin, Raytheon and TRW Incorporated, Boeing North America, is also working with UMDC to develop the NMD program.¹²⁰ In essence this program is an example of the workings of the modern U.S. military-corporate industrial complex with a harmonious blending of perceived national defence needs with private corporate profit-orientated objectives. As for protecting the health of the public living in the vicinity of NMD/TMD radar facilities, ANSI/IEEE C95.1-1991 is quoted as ensuring safety.¹²¹

¹¹⁶ Asia-Pacific EMF Conference, op. cit., p. 42.

¹¹⁷ *ibid*, p. 40.

¹¹⁸ Ferguson, 1999.

¹¹⁹ Department of Defense: 2006-2008 Program Acquisition Costs by Weapon System, http://www.defenselink.mil/comptroller/defbudget/fy2008/fy2008_weabook.pdf, Accessed Dec. 28, 2008.

¹²⁰ Federation of American Scientists, ‘National Missile Defense’, *FAS Special Weapons Monitor*, <http://www.fas.org/spp/starwars/program/nmd>, Accessed Dec. 28, 2008.

¹²¹ S. Aftergood, Federation of American Scientists, ‘Ground Based Radar [GBR] X-Band Radar [XBR]’, *FAS Special Weapons Monitor*, <http://www.fas.org/spp/starwars/program/gbr.htm>, Accessed Dec. 28, 2008.

The international deployment of these inter-related missile and radar systems obviously requires the co-operation of national governments where the systems are to be based. This is seen with the Czech Republic and Poland where the respective governments have given approval to build a NMD facility in each country: a missile interceptor launch facility in Poland¹²² and a radar facility in the Czech Republic.¹²³ These developments have not been without public protests in both countries. In an August 2008 survey conducted by CBOS, a publicly funded institute based in Warsaw, they found that 56% of Poles were against the deployment in Poland as they thought it could increase the possibility of a Russian attack on the country. In October 2008, as a result of the Russian attack on Georgia, that increased to almost 66%.¹²⁴

A public opinion survey of Czech citizens, conducted by the Public Opinion Research Centre, Institute of Sociology, Academy of Sciences in the Czech Republic found similar opposition to MND facilities in their country. 66% of the Czech citizens surveyed did not agree with the siting of the U.S. anti-missile radar in their country with 71 % respondents expressing their opinion that this question should be decided in a referendum.¹²⁵ Protests centred on concerns that the base could make the country a target for Russia if hostilities ever broke out. Although there was an article in the *Financial Times*¹²⁶ and on the BBC News¹²⁷ that villagers close to the planned radar facility were concerned about possible health hazards from the radar emissions, this does not appear to be the case in other parts of the country. Although it is not known what is the extent of wider Czech public awareness of their nation's former RF standard (and the reasoning behind it), the continuing existence of the stricter Russian Federation RF standard could lend credibility to possible Czech public concerns over the possibility of hazards not addressed by the ICNIRP guidelines and the IEEE C95.1. standard. Thus, the Russian Federation's strict RF standard has the potential to complicate the international planned deployment of U.S. NMD radar systems as it brings into question the credibility of the standards that underlay claims of safety. If public concerns in the Czech Republic, and other Eastern European countries that may host U.S. radar systems, expanded into one of possible non-thermal long-term effects from the radar systems then this would be a threat to the successful implementation of US military objectives. For the DoD and their contractors, any hint or admission that there may be biological hazards from their weapons technologies at levels below the official thermally based standards would validate the Russian Federation's RF standard and undo half a century's assurances of RF safety. This obviously would make continuing military radar development and deployment difficult with a significant financial loss for the

¹²² V. Gera, 'Polish Support for Missile Deal Soars' ABC News, Aug. 18, 2008,

<http://abcnews.go.com/International/wireStory?id=5602563> , Accessed Dec. 31, 2008.

¹²³ M. Dokoupil, 'Czech Upper House Approves Missile Shield', ABC News, Nov. 27, 2008,

<http://abcnews.go.com/International/wireStory?id=6347932> , Accessed Dec. 31, 2008.

¹²⁴ B. Roguska, 'The Poles about the anti-missile shield', Polish Public Opinion, Oct. 2008,

http://www.cbos.pl/PL/publikacje/public_opinion/2008/10_2008.pdf , Accessed Dec. 31, 2008.

¹²⁵ J. Cervenka, 'Citizens on U.S. Anti-Missile Base in Czech Republic', Public Opinion Research Centre, Czech Republic, Nov. 7, 2008, <http://www.cvvm.cas.cz/index.php?disp=zpravy&lang=1&r=1&s=&offset=&shw=100837> , Accessed Dec. 31, 2008.

¹²⁶ J. Cienski, Czech village fears over US missile shield plan, *Financial Times*, Mar. 30, 2007,

<http://www.trokavec.cz/en/about-trokavec/articles-about-trokavec/financial-times-czech-village-fears-over-us-missile-shield-plan>, Accessed Dec 31, 2008.

¹²⁷ S. Fottrell, 'Czech fears over missile defence radar', *BBC News*, Jun. 6, 2007.

<http://news.bbc.co.uk/2/hi/europe/6726619.stm> , [Accessed Dec. 31, 2008].

corporations developing the technology for the DoD. For this reason they cannot back away from supporting the thermal status-quo in RF standard setting regardless of any advances in scientific understanding. This may be a factor the IEEE's ICES Subcommittee 4 decision to establish "guiding principles" that only thermal effects (established adverse health effects) can be considered in setting safety standards (Chapter 3).

The U.S. DoD and their corporate defence contractors have been involved in RF standards development right from the beginning in the 1950s. Considering this and their huge current financial commitment to development and deployment of high power military radar systems, it cannot be understated that the issue of low-level long-term (non-thermal) biological effects has been kept off the RF standard setting table for reasons far removed from an objective assessment of the risks that may be involved.

ICNIRP's illusory precautionary approach

An emerging global concern (discussed below) is that the increasing use of mobile phones by children may have unintended long-term adverse health consequences and therefore a precautionary approach is advisable to protect against possible damage to young developing brains. In June 2004 the WHO convened an international meeting specifically to address this concern. ICNIRP Chairman Carlo Vecchia summed up both the WHO's and ICNIRP's stand on the issue by stating:

The protection system using basic restrictions and reference levels makes the ICNIRP Guidelines flexible and applicable to virtually any exposure condition, and any group of population. Therefore, there is no need, or justification, for a special approach to the protection of children.¹²⁸

When David Black referred to "recommendations for precaution" (point #8 in the previous section) this was essentially ICNIRP's so-called precautionary approach, which was a central feature of disagreement within the Australian TE/7 committee. As examined in Chapter 5, the TE/7 committee failed in March of 1999 to approve the ICNIRP Guidelines for RF because a significant number of committee members, after extensive consideration, did not consider that ICNIRP recommendations followed a precautionary approach for all possible hazardous situations. This was due to the fact that much of the scientific basis for the ICNIRP limits was from short term, acute exposure (thermal) studies on animals and not long term, low level, chronic effects which many public and committee member submissions were concerned with. What was wanted by a significant number of TE/7 members was a precautionary approach specifically to address public concerns over possible health hazards from prolonged exposure to low-level RF emissions from telecommunications facilities. As was stated in a joint committee member submission to TE/7:

Comments on recent statements regarding the precautionary principle in the new draft: Unlike the Interim Standard [the previous Australian/New Zealand RF standard], the new draft [based on ICNIRP] does acknowledge that it is based on thermal effects only. The 'safety margin' of 50 (for the public) is based on thermal

¹²⁸ P. Vecchia , 'The approach of ICNIRP to protection of children', Bioelectromagnetics, vol.26, issue S7, 2005, pp. S157-S160.

considerations only. It cannot be said therefore to constitute a precautionary measure for non-thermal effects. The public is concerned about whatever non-thermal effects may occur at exposure levels possible in accessible areas near a transmitter. These levels are of the order of a few microwatts/cm². If there are effects at such levels, clearly they are not covered by the thermally-based exposure limits.¹²⁹

These concerns expressed within the TE/7 committee are reflected by the later (2004) conclusions of ICNIRP's peer review Standing Committee on Epidemiology in their review of the available RF epidemiological literature. This was undertaken to update the earlier RF epidemiological section in the ICNIRP Guidelines, summarise the current scientific understanding, improve future methodologies and plan for future studies. The committee concluded, in part, that:

Results of these studies to date give no consistent or convincing evidence of a causal relation between RF exposure and any adverse health effect. On the other hand, the studies have too many deficiencies to rule out an association...Despite the ubiquity of new technologies using RFs, little is known about population exposure from RF sources and even less about the relative importance of different sources. Other cautions are that mobile phone studies to date have been able to address only relatively short lag periods, that almost no data are available on the consequences of childhood exposure and that published data largely concentrate on a small number of outcomes, especially brain tumor and leukemia... Another gap in the research is children. No study population to date has included children, with the exception of studies of people living near radio and TV antennas. Children are increasingly heavy users of mobile phones. They may be particularly susceptible to harmful effects (although there is no evidence of this), and they are likely to accumulate many years of exposure during their lives.¹³⁰

In spite of the apparent need to take a precautionary approach in face of the uncertainties stated by the ICNIRP epidemiological committee, especially to protect the future health of children, ICNIRP chairman Vecchia ruled out such an approach at the September 2004 international conference on mobile phones and health, held in Moscow. According to Vecchia:

Precautionary actions to address public concerns may increase rather than mitigate worries and fears of the public. This constitutes a health detriment and should be prevented as other adverse effects of EMF.¹³¹

As examined in this chapter on the promotion of the ICNIRP Guidelines internationally, those pushing for these guidelines as a basis for national RF standards present them as an internationally sound basis for providing full protection to the public from any hazards from the use of telecommunications technology. As an ARPANSA spokesperson stated in 2004, the Australian ICNIRP based RF standard "provides

¹²⁹ I. Beale, D. Maisch, J. Lincoln, Joint Submission to TE/7 Committee by the Australian & New Zealand Community / Consumer Committee Representatives, Mar. 3, 1999.

¹³⁰ A. Ahlbon, A. Green, L. Kheifets, D. Savatz, A. Swerdlow, 'Epidemiology of Health Effects of Radiofrequency Exposure', *Environmental Health Perspectives*, vol. 112, no. 17, Dec. 2004, pp. 1741–1754.

¹³¹ Maisch, 2005, op. cit., p. 7.

protection for people of all ages and health conditions (including children) whether they're exposed to EME irregularly or for 24 hours a day, 7 days a week."¹³² IEMFP makes a similar claim that the ICNIRP Guidelines "are designed to avoid all identified hazards from short and long term exposure, with a large margin of safety incorporated into the limit values".¹³³ This claim, however, is in conflict with what Vecchia stated at the Moscow conference that "ICNIRP only considers acute effects in its precautionary principle approach. Consideration of long term effects is not possible".¹³⁴

IEMFP incorporates risk assessment considerations into its definition of a suitable precautionary principle (or approach) for EMF/RF such as an "economic cost/benefit analysis". When such considerations are added to the RF precautionary equation the result is an emphasis on keeping extra costs to industry at a minimum by merely reducing RF emissions that are not necessary for the technology to function. Any consideration of costs to society if there was an uncertain level of health hazards is not part of the equation. This was the case for Australia's (and New Zealand's) "precautionary approach" in the current RF standard as will be examined in Chapter 5.

According to Adam Burgess, author of *Cellular Phones, Public Fears, And A Culture of Precaution* ICNIRP Chairman Paulo Vecchia provided him with valuable insights for his book that addressed the precautionary approach. In Burgess' opinion precautionary measures called for in the U.K. by the Independent Expert Group on Mobile Phones (IEGMP-May 2000), such as limiting children's use of cell phones, were simply the result of an institutional insecurity in British culture which has been influenced by a media-driven fear campaign over "unsubstantiated worries" about cell phone technology. Burgess considered the IEGMP as being responsible for enflaming the mobile phone health scare by its very consideration – thereby conferring a level of legitimacy to the debate, irrespective to the validity of the claims. Burgess argues that the various public campaigns which have sprung up in the UK over alleged health hazards are largely in response to "the agenda promoted by the media and government".¹³⁵ He called the cell phone risk debate (and the wider debate over health hazards from all wireless technology) as purely socially and politically constructed. He dismissed all evidence of adverse health effects as "hypothetical" and just "an idea" not based on any demonstrable evidence. A dismissal of any possible harm from cell phone use is seen where Burgess stated (perhaps referring to the ICNIRP RF guidelines) that the accepted scientific orthodoxy is "that only direct heating effects from [RF] radiation can be considered, and that these are simply too weak to cause harm".¹³⁶ If only heating effects can be considered in the risk evaluation of cell phone technology for standard setting, as Burgess suggests, then this conveniently avoids the need to consider the large level of uncertainty over health risks not directly related to heating such as those mentioned by ICNIRP's peer review Standing Committee on Epidemiology mentioned above.

However, the views of Vecchia, Anderson and Burgess are at variance with accepted definitions of situations where a precautionary principle (approach) is called for. For

¹³² ARPANSA/ACA, Mobile Communications and Health, (6 minute DVD presentation), Dec. 2004.

¹³³ WHO, 'Electromagnetic Fields and Public Health Cautionary Policies', WHO Backgrounder Fact Sheet, Mar. 2000, <http://www.elettra2000.it/pdf/report/oms-eng.pdf>, Accessed Jul. 4, 2008.

¹³⁴ Maisch, 2005.

¹³⁵ A. Burgess, *Cellular Phones, Public Fears, And A Culture of Precaution*, Cambridge University Press, 2004, p. 14.

¹³⁶ *ibid.*, p. 4.

example, according to the United Kingdom Interdepartmental Liaison Group on Risk Assessment (UK-ILGRA):

[W]here there is scientific uncertainty the precautionary principle establishes an impetus to make a decision that seeks to avoid serious damage if things go wrong ...The purpose of the precautionary principle is to create an impetus to take a decision notwithstanding scientific uncertainty about the nature and extent of the risk, i.e. to avoid 'paralysis by analysis' by removing excuses for inaction on the grounds of scientific uncertainty.¹³⁷

An excuse for inaction that claims to be a precautionary approach is a hazard in itself because it increases the worries and fears of the public and not only goes against the very concept of the precautionary principle, but casts the “public” as scientifically ignorant, prone to needless fears and anxieties and needing to be comforted that their fears and worries are unfounded. This is very much in conformity with John Graham’s revisionist “syndrome of paranoia and neglect” examined in Chapter 1, which discounts all environmental risks as a social problem of public misperceptions rather than objective environmental hazards.

Expert criticisms of the thermal limitations of both IEEE C95.1 and the ICNIRP Guidelines

On August 31, 2007, an international working group of 14 scientists, researchers and public health policy professionals (The Bioinitiative group) released an extensive scientific literature review of over 2,000 studies titled the “*BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF)*”.¹³⁸ The purpose of the report was to document the information that the report’s authors considered needed to be considered in the debate over the adequacy, or inadequacy, of existing public exposure standards. This included both extremely low frequency (ELF) and radiofrequency/microwave standards. The report included detailed scientific data, with references, documenting a whole range of chronic low-intensity, non-thermal adverse biological effects that have been established to occur at exposure levels well below ANSI/IEEE C95.1-1996 and ICNIRP limits. The report reviewed the risk assessment carried out by IEEE and WHO/ICNIRP that serve as the common basis for the thermally-based standards and documented a systematic filtering out of scientific studies that reported low-level bioeffects and potential health effects. The report specifically examined the limitations and deficiencies of the proposed IEEE SC-4 C95.1 draft standard as well as similar deficiencies in the ICNIRP Guidelines. In calling for new biologically based RF (and ELF) safety standards the report contains 11 chapters examining key scientific studies and reviews that have identified low-intensity (non-thermal) biological effects which provide a scientific basis for new safety limits based on traditional public health protection approaches. The fundamental reason for the writing

¹³⁷ United Kingdom Interdepartmental Liaison Group on Risk Assessment (UK-ILGRA) <http://www.hse.gov.uk/aboutus/meetings/ilgra/pppa.htm#3> , Accessed Jul. 8, 2008.

¹³⁸ C. Blackman, M. Blank, M. Kundi, C. Sage, D. Carpenter, Z. Davanipour, D. Gee, L. Hardell, O. Johansson, H. Lai, K. Hanson, E. Sobel, Z. Xu, G. Chen, A. Sage, ‘BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF)’, released Aug. 31, 2007, <http://www.bioinitiative.org>, accessed August 31, 2007.

of the report was the increasing concern by a number of bioelectromagnetics researchers, scientists and public policy health experts over the unquestioned acceptance of IEMFP/ICNIRP claims that only immediate hazards from acute levels of EMF are to be considered as the only “established” health hazards from exposure. Understandably such a departure from standard setting orthodoxy would not escape criticism from organizations that have staked their own credibility on adherence to that orthodoxy. For that reason it is worthwhile to briefly examine the criticisms of the BioInitiative report by two organizations, the Australian Centre for Radiofrequency Bioeffects Research (ACRBR) and the Health Council of the Netherlands (HCN).

The Australian Centre for Radiofrequency Bioeffects Research (ACRBR), a university research partnership with Telstra has criticized the BioInitiative report as “largely inconsistent with current scientific consensus”. To quote:

“Do the BioInitiative Report authors represent an authoritative international body? Often in assessing public health issues, bodies are formed to evaluate evidence and offer recommendations about particular issues. The model that most scientific expert bodies in this area (e.g. World Health Organisation (WHO)) employ is to engage independent experts to provide a review and recommendations on an issue. Independent experts are engaged because it is meant to provide an objective evaluation of the issue. This contrasts strongly with the BioInitiative Report, which is the result of the opinions of a self-selected group of individuals who each have a strong belief that does not accord with that of current scientific consensus.”¹³⁹

The Health Council of the Netherlands (HCN), in its review of the BioInitiative report made a number of criticisms of various sections of the report but their main criticism centres around the divergence from the ‘official’ guidance. To quote in part:

“A report published on 31 August 2007 is playing an increasingly prominent role in the debate on electromagnetic fields and health: the BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF). The report contains recommendations on establishing limits for exposure to electromagnetic fields that are much lower than the limits that are currently applied in the Netherlands and in many other countries, and is receiving increasing attention from society....Scientific advisory reports are usually the result of a process in which a group of experts, using the current state of science, extensively discusses a topic until a consensus is reached. The group is made up of independent experts from the various areas of expertise relevant to the topic. In the case of electromagnetic fields, for example, this would be biologists, epidemiologists, technical experts, physicians and in some cases also psychologists and risk experts. This procedure is followed by bodies such as the World Health Organization (WHO) [IEMFP] and the Health Council, as well as organizations involved in drafting proposals for exposure limits, such as the International Commission on Non-ionizing Radiation Protection (ICNIRP) and the International Commission for Electromagnetic Safety (ICES) of the Institute of Electrical and Electronics Engineers (IEEE). The various experts and the interactions between them, combined with a review of all relevant scientific information, ensure

¹³⁹ ACRBR, <http://www.acrbr.org.au/FAQ/ACRBR%20Biointiative%20Report%2018%20Dec%202008.pdf>, Accessed Apr. 24, 2009.

that a balanced judgment on the latest scientific knowledge can be reached. It is of importance that this process is transparent. This multidisciplinary weight-of-evidence method leads to a scientifically sound judgment that is as objective as possible. The BioInitiative report did not follow this procedure."¹⁴⁰

The above statements clearly illustrate the entrenched nature of the thermal paradigm. When detailed evidence is given that casts doubt on that paradigm, that evidence is rejected because it is not in conformity with the current orthodoxy. The ACRBR and HCN statements give the impression that the standard setting science of IEMFP, ICNIRP and the IEEE is a body of sure and certain knowledge that is above reproach. This thesis has presented the case that this is far from the truth of the matter.

On September 4, 2008, The European Parliament voted 522 to 16 to recommend tighter safety standards for cell phones based on growing evidence of a link between brain tumours and cell phone use. The Parliament stated that "[t]he limits on exposure to electromagnetic fields [EMFs] which have been set for the general public are obsolete". The EU Parliament specifically mentioned that their recommendations were also based on the Bio-Initiative report and the need to "address vulnerable groups such as pregnant women, newborn babies and children."¹⁴¹

On September 17, 2007, the European Environmental Agency issued a press release that supported the conclusions and recommendations of the Bioinitiative report. The EEA had contributed to this report with a chapter drawn from the EEA study "Late lessons from early warnings: the precautionary principle 1896-2000", published in 2001. Professor Jacqueline McGlade, Executive Director of the EEA, stated the following:

There are many examples of the failure to use the precautionary principle in the past, which have resulted in serious and often irreversible damage to health and environments. Appropriate, precautionary and proportionate actions taken now to avoid plausible and potentially serious threats to health from EMF are likely to be seen as prudent and wise from future perspectives. We must remember that precaution is one of the principles of EU environmental policy.¹⁴²

On November 3, 2008 the U.S. Congressional Committee on Oversight and Government Reform sent an official request, in the form of a letter, to the Chairman of the Federal Communications Commission (FCC) to provide the Domestic Policy Subcommittee with a detailed description of what measures FCC has taken to protect public health from a significant increase in public RF exposures as a result of new communications devices operating in the "White Spaces spectrum".¹⁴³ The letter specifically mentioned two expert group statements that questioned the adequacy of the existing RF standards in

¹⁴⁰ Health Council of the Netherlands, <http://www.gr.nl/pdf.php?ID=1743&p=1>, Accessed April 24, 2009.

¹⁴¹ University at Albany, Institute for Health and the Environment, 'European Parliament Recommends Stricter Safety Limits for Cell Phones', Sept. 8, 2008, <http://www.emfnews.org/European-Parliament-Recommends-Stricter-Safety-Limits-for-Cell-Phones.html>, Accessed Sept. 19, 2008

¹⁴² European Environment Agency, press release, Radiation risk from everyday devices assessed, Sept. 17, 2007, <http://www.eea.europa.eu/highlights/radiation-risk-from-everyday-devices-assessed>, Accessed Sept. 18, 2007.

¹⁴³ This refers to the largely unused portions of the radiofrequency spectrum, particularly the range allocated for analogue television and those acting as buffers to prevent interference between TV channels. With the switch over to digital television this frequency range will become available for new wireless technologies.

regards to protecting the public from non-thermal chronic exposures.¹⁴⁴ The oversight committee called upon the FCC to “match its concern for commercial interests with concern for human health of the future consumers of this technology”.¹⁴⁵

On February 23, 2009 the European Parliament Committee on the Environment, Public Health and Food Safety adopted a resolution in a 43-1 vote to urge the European Commission to recognize the growing public and scientific concern over health risks from EMFs. Part of the 29-point resolution called for a review of the adequacy of the existing EMF (including RF) limits.¹⁴⁶

On April 2, 2009 the full European Parliament adopted a report on avoiding the potential risks of electromagnetic fields with 559 votes in favour, 22 against with 8 abstentions. The report, drafted by Frederique Ries from Belgium, urged the European Commission to review “the scientific basis and adequacy of the EMF limits as laid down in recommendation 1999/519/EC”¹⁴⁷ which are based on the ICNIRP guidelines.

Yuri Grigoriev, Chairman of the Russian National Committee on Non-Ionizing Radiation Protection (RNCNIRP), addressed the issue of over-restrictive interpretations of health hazards from RF exposure (addressing both IEEE C95.1 and ICNIRP interpretations). In his letter to *Bioelectromagnetics* (2004) Grigoriev used the example of the Health Council of the Netherlands erring in its unquestioned acceptance of the ICNIRP Guidelines when it concluded that it saw “no reason for recommending limiting the use of mobile phones by children”. According to Grigoriev, the problem was that a “one- sided analysis of the problem had been made, using only a physical approach and not taking into account worldwide experience in monitoring and investigations by physiologists, psychologists, morphologists, paediatricians, and other specialists and fields”. It was Grigoriev’s opinion that including these additional factors was essential in determining the actual hazards to health.¹⁴⁸

In arriving at its latest recommendations, the IEEE SC-4 C95.1 committee (ICES) stated that it had conducted “a comprehensive review of the scientific data...including those studies that involve low level exposures where increases in temperature could not be measured or were not expected.” The committee dismissed the issue of low-level, non-thermal, biological effects with the statement that, as a result of their review, a “lack of credible scientific and medical reports showing adverse health effects for RF exposures at or below similar exposure limits in past standards supports the protective nature of

¹⁴⁴ National Toxicology Program (U.S.), Fact Sheet: ‘Studies on Radiofrequency Radiation Emitted by Cellular Phones’, National Institute of Environmental Health Sciences, 2005. And: National Research Council of the National Academies (U.S.), *Identification of Research Needs Relating to Potential Biological or Adverse Health Effects of Wireless Communication Devices*, The National Academies Press, 2008.

¹⁴⁵ D. Kucinich, Chairman, Domestic Policy Subcommittee, Re: White Spaces Unlicensed Operation in the TV Broadcast Bands (ET Docket No. 04-186). Letter to FCC Chairman Kevin Martin, U.S. Congressional Committee on Oversight and Government reform, Nov. 3, 2008.

¹⁴⁶ European Parliament, Motion For A European Parliament Resolution On Health Concerns Associated with Electromagnetic Fields. <http://www.europarl.europa.eu/oeil/file.jsp?id=5680652>, accessed Mar. 3, 2009.

¹⁴⁷ European Parliament, Directorate for the Media, Press release, ‘Avoiding potential risks of electromagnetic fields’, Apr. 2, 2009. Full resolution at: <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2009-0216+0+DOC+XML+V0//EN>, accessed Apr. 7, 2009.

¹⁴⁸ Y. Grigoriev, ‘Letter to the Editor, Mobile phones and children: Is precaution warranted?’, *Bioelectromagnetics*, vol. 25, Issue 5, 9 June 2004, pp. 322-323.

the exposure limits.”¹⁴⁹ However, in his review of the IEEE’s data-base, theoretical biophysicist Vladimir N. Binhi from the Russian Academy of Sciences wrote that the IEEE’s dismissal of non-thermal effects was essentially based on flawed reasoning. According to Binhi, the IEEE incorrectly considered non-thermal effects as not possible since they contradict the known laws of physics and evidence for such effects are simply artefacts since they are not replicated in other labs. Where they have been replicated, IEEE considered that they had no significance for human health.¹⁵⁰ Binhi analysed the IEEE data-base used as the rationale for the IEEE standard. Although it contained over 1300 references, a discrepancy is seen between the number of non-thermal papers cited in the IEEE standard compared to a 2005 Swedish review of research on non-thermal biological effects of microwaves. This review, by Igor Belyaev,¹⁵¹ included 115 references for peer reviewed and published non-thermal research papers, of which only about 25% are referenced by IEEE’s RF/MW standard. Another 85 recently published papers, most showing non-thermal effects, were not included in the references for the IEEE standard¹⁵². Given this discrepancy, Binhi stated that “consumers of the electromagnetic safety standards might expect a more attentive and careful attitude to human health.”¹⁵³

The above criticisms of the thermal paradigm maintained on an international setting by IEEE, IEMFP and ICNIRP raises serious questions over their risk assessment methodology that has long maintained that possible prolonged low-intensity (non-thermal) biological effects are beyond the scope of RF standard setting. Despite these criticisms, however, the thermal paradigm still reigns paramount with most government radiation protection agencies.

Why this is so can be seen as a consequence of a number of interrelated factors:

- There has been a strong vested interest (military and corporate) involvement from the very beginnings in establishing a thermally based RF standard philosophy that conformed to their various operational requirements which was promoted on the global stage through the WHO and international scientific seminars as a body of sure and certain knowledge that was above serious criticism.
- The necessary research effort has long been predominantly under the control and funding of the telecommunications industry with little, if any, interest in conducting truly independent research that could challenge the thermal-only validity of the standards.
- The increasing trend to base national standards on so-called global international standards, such as ICNIRP, promoted by the World Health Organization (WHO). After all why re-invent the wheel!

¹⁴⁹ IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz" (IEEE Std C95.1-2005), 1.3 Introduction, p. 2.

¹⁵⁰ N. Binhi , Some notes to the new IEEE electromagnetic safety standards, General Physics Institute of the Russian Academy of Sciences, 2006, <http://www.safewireless.org/Portals/1/Documents/Binhi.IEEE.notes-2006-electromagnetic%20standards%20to%20IEEE.pdf> , accessed August 28, 2006.

¹⁵¹ I. Belyaev , ‘Non-thermal Biological Effects of Microwaves’, *Microwave Review*, p. 13 –29, Nov. 2005

¹⁵² Belyaev, 2005.

¹⁵³ Binhi, 2006.

- Global standards are also stipulated as World Trade Organization (WTO) requirements where national standards are not to be a barrier to economic and technological development.
- There is a huge financial incentive for national governments to promote the introduction of new wireless technology through taxes, the sale of spectrum licences and in the case of Australia, being a major share holder of Telstra, the nation's premier carrier. In this case there is a strong incentive for agencies to follow government policy.
- There are extensive advertising campaigns by industry and their public relations groups extolling the many benefits of new technology to all age groups and downplaying any possible health hazards whatsoever.
- Society has developed a love of new communications technology that has radically transformed modern life resulting in a reluctance to question the safety of such convenient devices. This can be expressed as an opinion that 'if it was dangerous it wouldn't be allowed on the market' (notwithstanding the sale of cigarettes!). This opinion is strengthened with media reports of conflicting studies that reinforce the level of uncertainty over the existence of possible health hazards.
- The telecommunications industry coordinates its activities on a well-planned global scale using professional public relations firms, industry trade organizations and lobby groups commissioned to maintain the status quo. In comparison, public concerns and activist opposition tend to be on a local or regional scale (NIMBY) which only last until their particular battle is either won or lost.

These factors combine to make a powerful force in maintaining the status quo for RF standard setting: WHO promoted international standards (or guidelines re. ICNIRP) that maintain the paradigm for the benefit of the corporate and military users who developed the standards; national governments supporting that paradigm for economic reasons; national radiation protection agencies following government policy; and a relentless bombardment of advertisements in all medias promoting public consumption and the indispensability of new wireless technology.

As a consequence of these factors in current day Australia, the United States the U.K and many other so-called Western countries, trade unions, environmental and consumer organizations, and political parties have largely avoided questioning the adequacy of the RF standards and safety aspects of telecommunications technology. This is a prime reason why the thermal paradigm still reigns supreme.

Conclusions: An inability to learn?

The ICNIRP Guidelines are being promoted internationally as an unproblematic body of sure and certain knowledge that is above reproach. At various international EMF conferences this has been the consistent message given by Dr. Michael Repacholi, when he headed IEMFP and as Chairman of ICNIRP. As illustrated by the case of Australia

(Chapter 5), the ICNIRP Guidelines have been portrayed by factions pushing for ICNIRP incorporation in the RF standards committee as the state-of-the-art in providing health protection from all 'known' hazards from telecommunications technology. This viewpoint was steadfastly maintained despite attempts by a significant number of other committee members to include consideration of other bioeffects not related to simple heating.

In an ever increasingly globalised world the reliance on international organizations to set standards to protect public health seems inevitable. Proposed internationalised standards such as ICNIRP's recommendations act as an aid to economic development by not hindering trade that might conflict with more strict national standards (such as the Russian Federation, the Czech Republic's former standard and China for example). In the delicate trade-off between economic benefits and adequate health protection international organizations should ideally be "eternally vigilant" to ensure that their tasks are not co-opted by vested interests groups that are the producers of risks to be regulated. This is illustrated by the WHO having to establish guidelines against intrusion by "Big Tobacco" interests. WHO apparently had forgotten that lesson, however, when it came to the WHO's EMF Task Group which, while writing a new Environmental Health Criteria for power frequency EMFs, allowed power industry representatives to have a significant say in the drafting of the document. In essence the producers of the risk were being allowed to set the parameters of the regulation of their activities.

Both IEMFP and ICNIRP have, from their establishment, insisted that the scientific evidence clearly indicates that the primary adverse effect from RF exposure is from high level exposures that excessively heat and thereby damage biological tissue. The challenge for these organizations is how to address the continuing evidence for other adverse health effects not related to heating as well as the calls for precautionary actions, especially with children and mobile phone use. ICNIRP claims to be open to change if new evidence comes to light, but it has not changed its thermal-only stand after 24 years of existence. IEMFP and ICNIRP may fear that to be seen as having to change their 'science based' guidelines would be a blow to their credibility as it would be an admission that they previously had it incorrect and were not an infallible source of expert scientific advice after all. Such an admission would also undermine the credibility of individual ICNIRP members who have spent their professional lives allied to a thermalist approach and have written many published papers in support of that approach. For them it would be extremely unpleasant to admit they were in error after all.

Another factor that acts against any change in the current thermal limitations of the ICNIRP Guidelines is that a primary purpose for some nations to incorporate the ICNIRP Guidelines has been to facilitate the introduction of new wireless technology, or as David Black put it, the aim was the "*stabilization of RF deployment*". This is seen in the case of Australia (Chapter 5) and the Czech Republic (this chapter). Any tightening of the limits in light of the possibility of low-level effects not related to heating could make a number of widely deployed wireless technologies out of compliance with tightened standards. This would bring up questions of liability and compensation for affected individuals and industries and then who would be liable? In either case IEMFP/ICNIRP's claims to be able to objectively assess the scientific literature and set adequate human health standard recommendations are compromised because of blatant

industry influence in the process contrary to their claims of independence. This exposes their fundamental risk assessment “quality criteria” as being based on considerations other than objective science¹⁵⁴. By refusing to acknowledge human fallibility ICNIRP’s authors have ignored a fundamental lesson about the evolution of scientific knowledge.

As Ulrich Beck, the German sociologist, observed, the history of scientific discovery was always less a history of the pure acquisition of knowledge than one of learning from mistakes and practical lapses in scientific objectivity. Scientific ‘knowledge’, ‘explanations’, and practical ‘suggested solutions’ have contradicted each other over time, at different places, in different schools of thought, and cultures. Beck points out that this need not imply any loss in the credibility of scientific rationality claims so long as the sciences can succeed in handling the mistakes, errors and criticism of their methods within science.¹⁵⁵ According to Beck:

If side effects [health hazards] are no longer to be accepted, techno-scientific development must guarantee the ability to learn at every stage, at its pace and through the ways it advances. This presupposes that developments which create irreversible situations will be avoided. What is important, in contrast, is to reveal and work out those variants of techno-scientific development that leave room for mistakes and corrections. Technological research and policy must proceed from the ‘theory’ that has to this point proven most confirmed and most attractive: that of the entrapment of human thought and actions in mistakes and errors. Where technological developments begin to contradict this one certainty . . . they encumber humanity with the unbearable burden of infallibility. As risks multiply, the pressure grows to pass oneself off as infallible and thereby deprive oneself of the ability to learn.¹⁵⁶

On the part of both IEMFP and ICNIRP, a disregard for their own stated principles on independence from industry and following questionable criteria for evaluating science, suggests an agenda to cut off the scientific controversy over EMF human health hazards by less than scientific means. It could be argued that IEEE’s openly industry and military dominated standard setting process is at least more honest than WHO / ICNIRP masquerading as independent scientific voices free of vested interest machinations.

If successful, will IEMFP/ ICNIRP’s harmonization attempts end the scientific debate in RF standard setting by relegating all opposing science to a pseudo-scientific wilderness? According to ICNIRP Chairman Paolo Vecchia there are a number of benefits in nations accepting the ICNIRP Guidelines, such as increasing public confidence, reducing the debate and fears about EMF/RF, avoiding public confusion and provide public health protection at the same high level, to list a few.¹⁵⁷ As this thesis contends, however, by accepting these guidelines precautionary public health protections are sacrificed for the benefit of a Procrustean conformity defined by industry and military dimensions.

¹⁵⁴ As stated in the ICNIRP Guidelines, “Development of guidelines on exposure limits requires a critical, in-depth evaluation of the established scientific literature using internationally accepted quality criteria...”

¹⁵⁵ U. Beck, on ‘Infallibility or Ability to Learn’ in *Risk Society: Towards a New Modernity*, Sage Publications, 1992, p. 159.

¹⁵⁶ *ibid.* p. 177.

¹⁵⁷ P. Vecchia, ‘Electromagnetic Fields and Health: Effects, Perception, Protection’, ICNIRP, Montevideo, Uruguay, Mar. 5, 2009, <http://www.msp.gub.uy/andocasociado.aspx?2819,16619>, Accessed April 3, 2009.