



## A News Report on the Health Effects of Electromagnetic Energy.

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### Article 1

## A Tale of Two Reviews: NAS/NRC Vs. NCRP

### NAS/NRC report (1996)

On October 31st, the US National Academy of Sciences, National Research Council (NAS/NRC) issued a review of the EMF literature; Possible Health Effects of Exposure to Residential Electric and Magnetic Fields. The conclusions of this report are that there is no conclusive and consistent evidence showing that exposure to residential electric and magnetic fields produces cancer, adverse neurobehavioral effects, or reproductive and developmental defects. Of significant importance are the words, "conclusive and consistent". Like the more familiar phrase in law, "beyond reasonable doubt", "conclusive and consistent" imply a certain standard of evidence that warrants more serious action. Using that standard of evidence, the NRC Committee concluded that research results do not show that EMF exposure at a residential environmental level causes adverse health effects.

According to the newsletter EMF Health Report, (Nov/Dec 1996) published by the U. S. based Information Ventures: "The findings to date do not support claims that EMF's are harmful to a person's health," said Dr. Charles Stevens of the Salk Institute, who was the chair of the NRC Committee that wrote the report. The official NRC/NAS news release headline states: "No Adverse Health Effects Seen From Residential Exposure to Electromagnetic Fields."

As a result of this "not guilty" verdict the US Department of Energy (DOE) plans to stop all EMF research in September 1998 and there is the likelihood that the US House of Representatives and the Senate will drastically cut the budget for future US EMF research.

In the Electrical Supply Association of Australia's (ESAA) newsletter EMF Update of January 1987, it is reported: "In an extensive review of the scientific literature relating to the possible health effects of exposure to residential electric and magnetic fields the (NAS) concluded that "the current body of evidence does not show that exposure to these fields presents a human-health hazard" NAS appointed an expert committee of 16 scientists to review 17 years of research (costing \$500 million)\* in hundreds of studies on three continents. The present report is the result of that effort It (the NAS report) is an important benchmark document in the history of the EMF scientific debate against which future research findings will need to be viewed."

Is the NAS/NRC report a conclusive vindication for EMF's? The answer to that question depends upon your viewpoint. If you take a narrow legalistic interpretation, such as DOE does, the 'not

guilty' verdict may seem appropriate, especially if you take into account only the evidence considered by the NRC Committee.

However if you take a scientific interpretation and consider all the available evidence, the conclusion is inescapable. So many scientific studies were excluded from the "extensive" NAS/NRC report, that its conclusions cannot be considered an accurate review of the current scientific literature.

In its review of the literature, the NRC Committee restricted themselves to considering only studies published in peer-reviewed journals up to mid 1995, when the report was drafted. This excluded occupational studies such as the Ontario Hydro worker study which found a strong leukemia/EMF linkage (see page 4), the recent Boston University study which reported a link between female breast cancer and EMF's , and the four replicated melatonin/EMF studies, which found low level commonly encountered magnetic field exposures can reduce the ability of melatonin to suppress breast cancer cells (see page 5), just to mention a few. In fact the NRC Committee only considered approximately half the available evidence which was available to them. Dr. Kjell Hansson Mild of the National Institute for Working Life in Sweden, asked Dr Stevens, chair of the NRC Committee, how "the report turned out to be so biased in its selection of papers." Mild, past president of the Bioelectro-magnetics Society, noted that the report mainly included papers that showed no effect and omitted those that found a biological response. (Microwave News, Jan/Feb.1997 . P.2)

In a clever manipulation of words, more akin to an industry public relations exercise, the NRC press release states "To date, they have found no evidence to show that EMF's can alter the functions of cells at levels of exposure common in residential settings. Only at levels between 1,000 and 100,000 times stronger than residential fields have cells shown any reaction at all to EMF exposure In fact, exposure may actually help the body in some subtle ways, for example by speeding up the healing process after a bone is broken."

"To date" means a cut off date of mid 1995 for peer reviewed and published research, a process which can take years, thereby conveniently omitting the very studies which had results opposed to the NAS/NRC report's own findings.

To be fair to the NAS/NRC report, the meta-analysis of 11 residential epidemiological studies was one of the most thorough to date. What it did find is that there is a reliable statistical association between childhood leukemia and power line proximity, as classified by wire codes. As Dr. Richard Luben, NRC committee member remarked, "The level of association between power lines and leukemia is roughly the same as the correlation between second-hand smoking and lung cancer".

However, because the committee was looking for conclusive evidence of a connection with EMFs, it was able to dismiss all data which failed to meet this criteria and therefore could not conclude EMFs were to blame. Epidemiology looks for increases in risk factors, it does not deal with conclusive proof. By setting such an impossible standard the National Academy of Science was able to dismiss the EMF link with childhood cancer and announce to the world that there was nothing to worry about.

The NAS press release also states, "The committee also called for more research into the relationship between high exposures to EMF's and breast cancer in animals already exposed to

other carcinogens, and on reasons why electromagnetic fields seem to affect the levels of the hormone melatonin in animals, an effect not reproduced in humans." This statement gives the impression that there is no evidence that EMF's affect melatonin in humans

The NAS can only state this by ignoring the four replicated melatonin studies on human breast cancer cells (see page 5) showing that a 50-60 Hz, 12mG magnetic field can reduce melatonin's ability to suppress breast cancer cells in vitro. This was simply done because these studies did not meet the NAS/NRC's strict criteria for acceptance. As for further evidence of an effect on humans from human exposure studies, completed since the NAS/NRC report was released, consider the following:

- 1) A preliminary study of 60 workers at a Finnish garment factory found a "highly significant effect" of EMF's in reducing nocturnal levels. (see page 6)
- 2) In a study of 192 electric utility workers, Drs. John Reif and James Burch from Colorado State University found that some EMF exposures are associated with lower levels of melatonin. (page 6)
- 3) In a study by Swedish researchers, it was found worker's levels of melatonin decreased significantly after a day of computer work, suggesting that "there is a direct impact from the electromagnetic environment of the [VDT] on levels of melatonin. (page 6)

\*(This is a somewhat misleading statement; 17 years of research may have cost \$500 million, but the NAS report cost the Department of Energy (DOE), who contracted the NAS to do the review, \$622,000.)

### **NCRP draft report (1995)**

The U.S. National Council on Radiation Protection and Measurements (NCRP), a congressionally chartered organisation, was contracted by the Environmental Protection Agency (EPA) in 1983 to conduct a review of the biological effects of Extremely Low Frequency (ELF) EMF's. Work was discontinued in 1986 due to funding cuts at the EPA, but resumed in 1991. In early 1995 the draft of the 800 page NCRP report was leaked to the New York based publication Microwave News, which published the report's findings in August 1995. The final report was supposed to be publicly available in early 1996, but has received such intense industry opposition to its findings that its final outcome remains uncertain.

The Committee's membership was described by chairman Dr. Ross Adey as "carefully selected to cover the great majority of societal interests on this scientific problem, including power industry engineers, epidemiologists, public health specialists as well as molecular and cellular biologists. "The draft report generally endorses a 2mG exposure limit. It would immediately effect new day-care centres, schools and playgrounds, as well as have implications for new transmission lines near existing housing.

A somewhat more flexible policy would be applied to new housing and offices. For existing facilities, the committee recommended a more gradual approach, with stronger restrictions phased in over time if the evidence of a health risk continues to grow.

From the Committee's Conclusions

"In arriving at the proposed guidelines, the committee has considered available laboratory studies on bioeffects and epidemiological reports of health hazards from electric and magnetic field exposure. In key areas of bioelectro-magnetic research, findings are sufficiently consistent and form a sufficiently coherent picture to suggest plausible connections between ELF EMF exposures and disruption of normal biological processes, in ways meriting detailed examination of potential implications in human health."

From studies on humans the committee cites evidence for a link between EMF's and: 1) childhood and adult cancer, including leukemia and brain cancer; 2) teratological effects and other reproductive anomalies; 3) neuroendocrine and autonomic responses which, separately or collectively, may have pathophysiological implications; 4) neurochemical, physiological, behavioural and chronobiological responses with implications for development of the nervous system.

From laboratory studies the committee notes that EMF's: 1) effect cell growth regulation in animal and tissue models in a manner consistent with tumour formation; 2) increase tumour incidence and decrease tumour latencies in animals; 3) alter gene transcriptional processes, the natural defence response of T-lymphocytes and other cellular processes related to the development and control of cancers; 4) effect neuroendocrine and psychosexual responses.

In relation to the effect of low level EMF's on melatonin, (evidence which the NAS/NRC report excluded) the committee concluded: "There has been a strong focus on ELF field actions in the pineal gland, relating to the pineal hormone melatonin, and on a broad series of regulatory functions mediated by this hormone. Melatonin plays a key role in controlling the 24-hour daily biological rhythm. Disturbance of the normal diurnal melatonin rhythm is associated with altered estrogen receptor formation in the breast, a line of experimental evidence now under study, or possible links between ELF field exposure and human breast cancer.

"Further, melatonin has general properties as a free radical scavenger, with the possibility of a preventative role in oxidative stress, recognised as a basic factor in a broad spectrum of human degenerative disorders, including coronary artery disease, Parkinson's and Alzheimer's diseases, and aging."

According to the committee, problematic sources of ELF EMF include local electrical distribution systems, as well as high voltage power transmission systems. Particular appliances, including electric blankets and VDT's also rate highly as problem sources, along with "various occupational environments".

The committee states that the evidence points to human health hazards in common exposures to EMF's, particularly magnetic fields exceeding 0.2uT (2 milli-Gauss) and electric fields at intensities in the range 10-100V/m (volts per metre).

"there is an implication that a significant proportion of the world's population may be subjected to a low level of risk, but a risk factor with significant societal consequences, by reason of its pervasive nature and the serious consequences for affected individuals."

NCRP interim exposure guideline recommendations:

The committee concludes that "neither laboratory studies nor epidemiological findings can yet establish well-defined thresholds for safety guidelines." Still, it contends: "From available epidemiological and laboratory data, it appears both prudent and responsible to set limits on permissible future exposures. Therefore it calls for "interim exposure guides", measures that "fall short of establishing either a standard or guideline, but offer guidance to limit exposure."

ALARA Policy Endorsed

While the report noted that committee members were not unanimous, it recommended a policy in which exposures would be "as low as reasonably achievable", known as ALARA. Over a three year period, ambient exposures in existing homes, schools and offices would be reduced to 10 mG. After six years, there would be an option to establish a guideline of 5 mG.

Each of these decisions would be based on whatever epidemiological and laboratory studies were then available. After ten years, a goal of 2mG would be considered. The report stipulates that mitigation of the existing EMF environment to this level should be adopted only after "a careful evaluation of its socioeconomic impact, as well as its cost-effectiveness."

With respect to future construction, the report recommended observing a 2mG exposure limit for schools and for new transmission lines near existing housing, with somewhat less strict guidelines for new housing and offices.

Committee member Dr. David Carpenter, of the School of Public Health at the State University of New York, Albany, said, "In almost any other type of environmental exposures, if the evidence were as strong as the association between EMF's and cancer, there would be extensive government regulation. The major reason that many members of the committee were unwilling to set more rigorous standards was that it would be horrendously expensive and unrealistic to enforce them." (Microwave News, July/Aug 1995)

It must be pointed out that the NCRP report is still in a draft form and as such is has no official standing at this time. Because of this there are many who would prefer that this report be ignored and that the NAS/NRC report be taken as the definitive evaluation on the health effects from exposure to EMF's. It will be a sad day for science if a report which can only arrive at its conclusions by ignoring a significant body of science is accepted as the definitive statement on the issue.

## Article 2

### **Ontario Hydro Worker Study finds significant leukemia risk**

In a large scale epidemiological study of 30,000 present and former male employees of Ontario Hydro (Canada), Anthony Miller and co-workers at the University of Toronto, looked at the cumulative effects of both magnetic and electric field exposures on the cancer incidence. Most epidemiological studies to date have concentrated on magnetic field exposures, assuming that they are the more biologically active component of the electromagnetic field. This study, and the UK study Extra low frequency electric and magnetic fields in the bed place of children

diagnosed with leukemia: a case-control study by Coghill, Steward and Philips (see article) indicate that electric field exposures may play a major role in the possible link between cancer and 50-60 Hz powerline EMF's.

"Up to now, people have tended to pursue the notion that any cancer effects were likely to be from magnetic fields," said Dr. Anthony Miller "However, this study suggests that electric fields are potentially critical to cancer risk."

This would indicate that the risks as found in previous epidemiological studies which only considered magnetic field exposures could well be understated and throws into doubt the conclusions of the NAS/NRC report, (see article - Page 1) which did not include the Hydro data in its own study.

With the Ontario Hydro study, at the highest level of exposure to both magnetic and electric fields, the odds ratio jumped from 3.51 to 11.2 when the researchers included the interaction of the effects of the two types of fields. When asked which estimate was more indicative of the actual cancer risk, Miller replied, "The correct way to think about it is the 11.2, because what you're actually looking at is the combined effects." Miller also said, "What worries me is that so much of the experimental cellular work that has been done has screened out the electric fields.

"When people say they've done a study that looked at magnetic fields and there's nothing there, I can't agree," Miller told the New York based Microwave News. "What our study says is, 'Well, you should have looked at electric fields too.'" The Ontario Hydro study reveals that workers exposed to the combined electric and magnetic fields had leukemia rates that were 11 times greater than expected. However, the risk was highest in relation to electric field exposures and the researchers concluded that the electric field effect is dominant. The result of the study was published in the July 10, 1996 issue of the American Journal of Epidemiology.

A study by Dr. Denis Henshaw and co workers of the University of Bristol, UK, also implicates the electric field. They found that the decay products of radon - a naturally occurring radioactive gas - are attracted to powerline frequency electric fields.

### Article 3

## **Mains power electric fields implicated in childhood leukemia cases**

The June issue of the European Journal of Cancer Prevention featured a paper, Measured Electric Fields in the Bed places of Leukemic Children by Roger Coghill, John Steward and Alasdair Philips, which showed a dose-response relationship between a child's mains frequency electric field exposure and the incidence of childhood leukemia. To quote from the author's 'Poster', printed in Powerwatch Technical Supplement, No.1, March 1996:

"Though nine of eleven studies of childhood cancer subtypes in relation to power frequency field generating and transmission equipment have uncovered positive associations, surprisingly the only three studies actually measuring magnetic field levels do not support anything like so strong an association as that observed with surrogate measures (e.g.wiring codes,distance etc.). The two negative studies (funded partly by power utilities) were subsequently admitted by their authors to be flawed.

At ELF frequencies both electric and magnetic components of the electromagnetic wave are inevitably present, but no fixed relation exists between them (as is with higher frequencies) since such fields are in the near field of the wave (length some 6000 km.). Accordingly any ELF study measuring the magnetic component can say nothing about its associated electric field.

Nevertheless, no study of childhood cancer to date has measured electric fields in relation to childhood cancer, except as partial spot measurements in room centres. Indeed the AC electric field has been largely disregarded in recent studies, since it varies with voltage not load, is easily shielded, and instruments are not readily available.

On the other hand, whereas the magnetic field is a locally variable exposure source, all domestic electrical wiring if live is a source of continuous electric field exposure, through locally within any room the level can vary up to tenfold. Moreover many animal and cellular studies point to the electric component as the active parameter in biological effects. Arguably therefore the principal place of domestic exposure to ELF electric fields is in the bedplace, and this may vary markedly from home to home, sources being not only derived from powerlines but also from proximal electric appliances or house wiring.

Against this background we aimed to measure the electric field continuously over a 24 hour period in the actual bed-place of children with leukemia, and compare these levels with those of controls, to see if the cases were being exposed to higher electric fields than normal.

As with other studies, no clear pattern of association with magnetic fields was found. The electric component however showed a statistically significant dose-response relationship between cases and relative risk factor

Conclusion:

Chronic exposure of children to the ELF electric component merits further epidemiological study."

#### Article 4

### **Recent Studies: EMF effects on melatonin**

In the lead article of the inaugural issue of Electromagnetics Forum, (Aug-DEC 1996), EMFs, Melatonin and Breast Cancer, three replication studies, presented at the 1996 BEMS Meeting in Victoria, Canada, were mentioned. These studies found that low level (12 milliGauss) exposure to 50-60 hertz electromagnetic fields (EMFs) can significantly reduce melatonin and Tamoxifen's ability to suppress breast cancer cells. Melatonin, produced by the pineal gland, is a potent cell protection and anti-cancer agent. Tamoxifen is one of the most widely used drugs in the treatment of breast cancer.

In the 1987, Steptens, et al paper, Electric power use and breast cancer; a hypothesis, it was suggested that electromagnetic fields (EMFs) reduce melatonin production by the pineal gland and that melatonin suppresses the development of breast cancer. (\*1)

Research in 1993 by Liburdy, et al, found that melatonin reduces the growth rate of human breast cancer cells (MCF-7) in culture, but that a 12mG, 60 Hz magnetic field can block the ability of melatonin to inhibit breast cancer cell growth. (\*2)

To briefly mention these three replication studies:

1) Lawrence Berkeley National Laboratory: Researchers found that a 12mG electromagnetic field can significantly reduce the growth inhibitory action of melatonin and Tamoxifen on breast cancer cell (MCF-7) growth. (\*3)

2) U.S. Environmental Agency: Researchers found that melatonin can inhibit the growth of MCF-7 cells in culture and that a 12mG, 60 hertz magnetic field can completely block this oncogenic action. (\*4)

3) Lawrence Berkeley National Laboratory: Researchers found that 12mG computer monitor magnetic fields also inhibit the ability of melatonin to suppress breast cancer cells in vitro. (\*5)

A further replication of these three findings was made by the Division of Biomedical Sciences, University of California, where Richard Luben and co workers "found that exposure of breast cancer cells to 2mG, 60 Hz EMF induced a reproducible net increase in the growth rate of MCF-7 cells treated with a physiological dose of melatonin." (\*6)

Many laboratory studies have not found the above effects, as researcher Dr. John Reif of Colorado State University said to Microwave News, "Most natural observations appear to find melatonin changes, while controlled lab studies tend not to. In a general way, I'm concerned that the controlled lab trials may not mimic exposures in the real world." (\*7)

The following three recent human exposure studies, as published in Microwave News (Mar/Apr.1997), when compared with the above replicated lab findings, will ensure that the hypothesis that EMFs may increase breast cancer risks will continue to be an important issue.

1) A preliminary study of 60 workers at a Finnish garment factory found "a highly significant effect" of EMF's in reducing nocturnal melatonin levels. Magnetic field measurements were taken for the two types of machines used in the factory and operators were assigned to high or low exposure groups, based on the type of machine they were using, with average exposures either above or below 10 milliGauss. Unexposed non industrial workers were used as controls.

The results of this study found strong effects of both magnetic field exposure and smoking on night time levels of melatonin. No difference was found in melatonin levels on week nights and Sunday nights, indicating "that the possible suppression caused by magnetic field exposure is chronic, with little recovery during the weekend," (\*8) - consistent with the effect of chronic electric field exposure in the rat experiments of Wilson et al. (1986) (\*9)

2) In a study of 192 electric utility workers, Drs. John Reif and James Burch, from the Colorado State University, found that some EMF exposures are associated with lower levels of melatonin. They found a significant association between magnetic field exposures and lower daytime melatonin levels on the second and third of three days of measurement. The lack of an effect on the first day (following a weekend or equivalent) may indicate a cumulative effect of exposure.



Some studies have suggested that EMF effects on melatonin may depend on whether the field is continuous or intermittent. Reif and Burch found that magnetic fields in the home that were "temporally coherent" (less intermittent) had a very significant impact on lower melatonin levels at night. They concluded that, the "intensity and temporal characteristics of magnetic fields appear to be involved in melatonin suppression." (\*10)

3) Office workers who used computer monitors (VDU's) had a significant reduction in circulating levels of melatonin over a course of the working day, according to a study by researchers Drs. Bengt Arnetz of the Karolinska Institute, and Mats Berg of the Karolinska Hospital in Stockholm Sweden. No such change was found during days at the office with no VDU use. According to the researchers, "this suggests that there is a direct impact from the electromagnetic environment of the VDU on levels of melatonin."

Levels of a different hormone, adrenocorticotrophic hormone (ACTH), went up during the working day and this showed a strong correlation with worker's subjective assessment of mental strain. Arnetz and Berg note that ACTH is "known as a classic stress hormone that reacts to mental strain." But in contrast, "occupational strain did not correlate with melatonin levels." (\*11)

An excellent 776 page resource book on this subject, *The Melatonin Hypothesis: Breast Cancer and Use of Electric Power*, edited by Drs. Richard Stevens, Barry Wilson and Larry Anderson, all from Battelle Pacific Northwest Labs. in Richmond Washington, can be ordered from Battelle Press for US\$87.50 + \$12.50. post & handling Fax: 0011-1-614-424-3819, E-mail: <press@battelle.org>

In the introductory chapter, the editors state, "The body of evidence is sufficient to bind electric power over for trial, but not nearly adequate to render a verdict."

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- 10) Microwave News, as above.
- 11) Microwave News, as above.

## **Article 5**

### **Electricity and Cancer The missing link?**

A University team led by Professor Denis Henshaw in the Department of Physics has discovered more evidence of the importance of electric fields as a possible cause of cancer. Professor Henshaw revealed the team's latest research results in a paper published in the International Journal of Radiation Biology (Vol.69:1, p.25-38, 1996).

Professor Henshaw and his team found that electromagnetic or EM fields had been shown to concentrate naturally occurring water droplets in the air (aerosols). Aerosols, his previous work had shown, contained the radioactive decay products of radon gas. Radon gas is a natural, colourless, odourless gas that emerges from rocks in many parts of Britain.

Professor Henshaw said that only standard physics was involved in explaining this process. It was not contentious. But of course if EM fields concentrated radon in aerosols they also must concentrate other harmful substances, including carcinogenic or cancer-causing agents. His latest research had implications in this area.

Such concentrations, he said, might explain the apparent link between EM fields (such as those around power lines) and enhanced cancer risks that had shown by epidemiological studies. He said that, given that pathogenic agents were concentrated, there should be no objection to a causal link between EM fields and the incidence of cancer.

Experimental evidence collected by Henshaw and his team indicates that 1) a likelihood of higher exposure to radon decay product aerosols exists near major sources of EM fields. 2) Since the effects have been produced by means of an applied mains potential but with no current flowing, this means that the effects are due to the electric field rather than the magnetic field component of the electromagnetic field. 3) The exposure to radon decay products is of special interest in view of the geographical links that have been seen between domestic radon exposure and the incidence of childhood leukaemia, childhood brain tumours and other childhood cancers, the same cancers that have been linked to EM field exposure. 4) Aerosols such as airborne

chemical pollutants when falling near a power line will be deflected towards the line. Scientists at the University of Bergen in Norway have found evidence of a higher number of several pollutants under power lines. 5) Airborne bacteria may also be attracted by electric fields.

In summary, Dr. Henshaw expects "power frequency electric fields to attract aerosols of all types: natural radioactive aerosols, non-radioactive chemical pollutant aerosols, bacteria, viruses and airborne fungi."

As reported in Microwave News (May/June 1996, p.18-19), researchers in the U.K. and the U.S. have raised strong objections to Dr. Henshaw's research findings.

Four members of the U.K. National Radiological Protection Board wrote in the May 96 issue of the Journal that it "seems most unlikely" that electric fields could have the effect reported by Henshaw. "The overall effect of the mechanisms considered by Henshaw et al, would be expected, if anything, to reduce slightly the activity of radon decay products deposited in the lung and hence reduce the dose to the lung and other tissues."

Henshaw replied to this criticism by stating, "Our measurements of increased airborne activity near a large source of EMFs lead directly to increased dose to all body organs via inhalation".

Dr. Larry Toburen of East Carolina University in Greenville, North Carolina wrote in the Lancet (April 20, 1996) "I am inclined to discount the electric fields-radon proposal" Toburen, who is project director of the NAS/NRC report (see Page 1), argued that lung cancer, which is associated with radon exposure, "has not been detected in excess in people living near power lines."

Toburen, who appears to follow the NRC/NAS tendency for selective memory, must not be aware of a letter published in the April 15, 1996 American Journal of Epidemiology, by Dr Thomas Erren of the University of California School of Public Health. Dr. Erren cited five studies showing associations between lung cancer and EMF exposures. They are three occupational studies- by a Swedish team, John Hopkins University and McGill University, which all found an association between lung cancer and EMFs and two residential studies, one from the U.K. and one from the U.S.

Dr Erren wrote that given that lung cancer is multifactorial, "a (co) carcinogenic potential of electromagnetic fields cannot be refuted at this time a link of [EMFs] to this malignancy would have considerable public health relevance." (Microwave News, May/June 1996, p.18-19)

## **Article 6**

### **Chronic health problems and transmission lines - A Preliminary Study**

A New Zealand study presented at the 2nd. World Conference on Electricity and Magnetism in Biology & Medicine, Bologna, Italy, in June 1997, found significantly increased risks for asthma, arthritis, type-11 diabetes and combined chronic health problems in adults living near transmission lines.

The study, titled: Chronic Health Problems in Adults Living Near High-Voltage Transmission Lines: Evidence for a Dose-Response Relation with Magnetic Field Exposure, was conducted by Ivan L. Beale, Department of Psychology, University of Auckland, Roger J. Booth, Department of Molecular Medicine, University of Auckland, and Neil E. Pearce, Wellington Asthma Research Group, Wellington Medical School.

As part of a larger cross-sectional study, in Auckland, New Zealand, 560 adults living near 50-Hz 110 kV transmission lines completed questionnaires about their residential location and existing health problems.

Magnetic field measurements were taken to provide an estimate of each participant's magnetic field exposure. Participants were then divided into five groups of 112, based on their exposure. Summary statistics for health status were calculated for each group and the groups were then compared for evidence of a linear relation between health variables and magnetic field exposure.

Significant linear dose-response patterns were found for self-rated overall health, asthma, rheumatoid arthritis, type-11 diabetes and all chronic health problems combined, but not for infections or allergies. Estimates of relative risk were calculated for each health variable, adjusted for the influence of possible confounders such as age, gender, ethnicity, smoking, alcohol use, years resident at address, educational qualification, life changes and perceived effect of powerlines on health.

Significantly elevated adjusted risk ratios were found for asthma, arthritis, type-11 diabetes and combined chronic health problems. The results are consistent with the hypothesis that 50-Hz environmental magnetic fields may affect human immune function.

According to the abstract:

"There have been several published investigations of the possibility that residential exposures to 50-Hz or 60-Hz electromagnetic fields might cause adverse psychological effects such as suicide and depression. However, the validity of these studies may have been limited by research design problems such as inadequate controlling for confounders or inadequate measurement of exposures.

The purpose of this study was to investigate a possible relationship between magnetic field exposure and psychological and mental health variables while controlling for potential confounders and using measurement methods that provided valid and reliable characterisation of magnetic field exposures.

Five hundred and forty adult occupants of houses sited close to transmission lines completed neuropsychological tests in major domains of memory and attentional functioning, rating scales measuring mental health, and questionnaires regarding standard demographic variables, psychological stressors, medical and work history, perceived health and beliefs about possible effects of powerline electromagnetic fields.

There were significant linear dose-response relationships between exposure and several psychological and mental health variables. In particular, higher time-integrated exposures were associated with poorer coding-test performance and more-adverse psychiatric symptomatology.

These results are apparently not a secondary effect of participants' beliefs about effects of electromagnetic fields, gender, socioeconomic level, life stressors, and beliefs about possible adverse effects of electromagnetic fields. There were significant linear dose-response relationships between exposure and several psychological and mental health variables. In particular, higher time-integrated exposures were associated with poorer coding-test performance and more adverse psychiatric symptomatology.

These results are apparently not a secondary effect of participants' beliefs about effects of electromagnetic fields, but are more consistent with a direct effect of chronic exposure to 50Hz magnetic field exposure on the nervous system."



#### Article 7

### **EDITORIAL Comment on the DOCA Fact Sheets**

In February 1997 the Department of Communications and the Arts' (DOCA) Committee on Electromagnetic Energy Public Health Issues released a series of 'fact sheets' dealing with various aspects of the mobile phone network in Australia.

The stated purpose of these fact sheets is to: "help keep interested members of the public informed about the latest substantiated scientific evidence and Government action on EME public health issues. They will be updated as necessary and additional fact sheets will be published as information becomes available. Regular information will also be provided to local governments, health and community centres and the media."

A read of these fact sheets immediately indicates that they do not present a balanced viewpoint in their representation of the state of current scientific evidence. When these sheets repeatedly refer to "scientific opinion" they are more accurately referring to the opinions of a select group of scientists and not to the actual science from many of the scientists working in bio-electromagnetic research. These fact sheets draw conclusions on the health effects of human exposure to mobile phone tower transmissions that simply can not be justified.

In the DOCA fact sheet titled; Health issues and electromagnetic energy from mobile phone towers, it is stated:

"Mobile phone towers produce very weak electromagnetic energy (EME) levels in the everyday environment. Concerns have been expressed that exposure to these levels may cause health problems. However, the weight of national and international scientific opinion is that there is no substantiated evidence that living near a mobile phone tower causes adverse health effects.

From a scientific view point the above statement says nothing. What is "the weight of national and international scientific opinion" and where has it concluded that "there is no substantiated evidence that living near a mobile phone tower causes adverse health effects"?

If DOCA is referring to the whole body of national and international RF/MW exposure standards, research studies, conference papers, articles, etc. published since the beginning of our modern era on electromagnetic radiation (EMR) surely they must realize that practically all of these documents are irrelevant to the safety (or not) of mobile phones and base stations.

Almost all of these studies deal either with the extremely low frequency (ELF) end of the electromagnetic spectrum or with acute short term exposures to RF/MW and not with the low power microwave frequencies used by mobile phones. The truth of the matter is that there are very few studies completed looking at the long term biological effects of people living near a mobile phone tower.

Optus, in its own information sheets, states that "after more than six thousand scientific studies the world over, there is still no convincing evidence of any adverse health effects caused by electromagnetic fields (EMF) from mobile phones or mobile phone base stations." As reported in the Financial Review, (12 July 1995) Dr Stan Barnett, Principal Research Scientist of the CSIRO's Ultrasonics Laboratory, Division of Radiophysics, challenged Optus on its statement about the alleged 6000 scientific studies:

"There have been nowhere near this many studies at frequencies relevant to use of cellular phones. Not even 600 or even 60."

When the DOCA fact sheets refer to "the weight of national and international scientific opinion" it is mainly referring to the opinions of the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The author of the fact sheets however, must be ignoring the ICNIRP's own summation of the state of current science, as mentioned in their April 1996 paper, Health Issues Related to the use of Hand Held Radiotelephones and Base Transmitters. (Health Physics, Vol. 70, no. 4, April 1996, pp. 587-593):

"The scientific literature on the biological effects of RF fields (including microwaves) has been reviewed extensively In order to address questions raised by prolonged exposure to modulated radiofrequency transmission, or specific end-points such as cancer, it is necessary to collect information from a wide range of experiments carried out on different biological systems exposed under various conditions. The relevance of these data to the exposure of people may, however, be limited due to differences in the coupling of the fields to the exposed objects and differences in the responses of different biological systems compared with those of humans." "Most of the established biological effects of exposure to RF fields are consistent with responses to induced heating, resulting in rises in tissue or body temperature of greater than 1 degree C.(UNEP/WHO/IRPA,1993). Most studies examined endpoints other than cancer, many examined physiological and thermoregulatory responses, effects on behaviour and on the induction of lens opacities (cataracts) and adverse reproductive outcome following acute exposure to relatively high levels of RF fields. Very few studies are relevant to the evaluation of RF exposure on the development of cancer in humans."

With the ICNIRP statement in mind, it would be more factual to state; 'the weight of national and international scientific opinion is that the necessary research to determine whether living near a mobile phone tower is harmful or not, has not yet been done.

There is now a large and growing body of scientific evidence indicating that low level chronic exposures to RF/MW radiation (which do not increase body temperatures non-thermal or athermal), have a subtle and cumulative biological impact. This evidence has largely been excluded from what these fact sheets refers to as "the weight of national and international scientific opinion".

For example, it is interesting to note that although the 1992 proposed American RF/MW standard (ANSI/IEEE) had a bibliography extending as far back as 1950, so few publications were judged to meet the ANSI criteria, that the U.S. Environmental Protection Agency (EPA) voiced its objection to the acceptance of the proposed ANSI/IEEE standard on the grounds of its use of gross effects only as a criteria for safety (High level thermal exposures).

The recently adopted American RF/MW standard, (part of DOCA's "international scientific opinion"), though better than the ANSI/IEEE proposal, still is only designed to protect against high level exposures. To quote from a US Environmental Protection Agency letter (Oct 1996) on this standard:

"While there is sufficient information on thermal exposure/effects on which to base a standard, the data base on low-level, long term exposures is insufficient to provide a basis for standards to protect the public against adverse human health effects that may result from long term, nonthermal exposures. Both the NCRP and ANSI/IEEE standards are thermally based, and do not apply to chronic, nonther-mal exposure situations. The statement referring to "adequate protection of public health" pertains only to thermally related effects."

The Australian public concerns about possible adverse health effects from mobile phone towers are not about being heated up, the Aust RF/MW exposure standard guards against that. They are however concerned about the long term (years) cumulative effect of exposure to the low level microwave radiation, and that is clearly not addressed in "international scientific opinion". It is unscientific for the DOCA 'fact sheets' to refer to irrelevant "scientific opinion" in an attempt to use it to suggest safety of mobile phone technology.

The "fact sheets" also make a statement that is no longer credible with the scientific community, and reveals a real lack of scientific basis for their statements. "To date the only biological effect that has been substantiated as a result of absorbing EME relates to partial or whole body heating (that is a 'thermal' effect)."

To clarify thermal and non-thermal effects, the following may be of benefit: The older 'thermal effects only' school, dates from the early days of our electronic era, when it was thought that the only harmful effects from EMR was the actual heating of body tissue at high exposure levels. This interpretation is favoured by the telecommunications industry, which obviously has a vested interest in maintaining exposure standards at existing, or even higher levels.

The 'non-thermal (a-thermal) effects' school would state that there is now adequate evidence, from both epidemiological and laboratory studies to conclude that low-level (athermal) electromagnetic radiation has a subtle effect on biological processes and this fact must be taken

into account in setting exposure standards. This line of thinking is well expressed by Professor Ross Adey, of the US Veteran's Administration Medical Centre in Loma Linda California.

Dr. Adey is the committee chairman for the U.S. National Council for Radiation Protection and Measurement's (NCRP) committee evaluating the standards for powerline frequency electromagnetic fields.

Dr. Adey has conducted a multi-million dollar research study into the safety (or otherwise) of mobile phones, funded by Motorola.

On July 25, 1995, I wrote to Dr. Adey and asked him: "Based on the current scientific knowledge, is it advisable to base RF/MW maximum exposure limits (standards) solely on thermal effects?" His reply, received in early August 1995 was as follows:

"You ask about exposure limits based solely on thermal effects. The laboratory evidence for athermal effects of both ELF and RF/Microwave fields now constitutes a major body of scientific literature in peer-reviewed journals. It is my personal view that to continue to ignore this work in the course of standard setting is irresponsible to the point of it being a public scandal."

The DOCA fact sheet referred to previously does however admit that there are non-thermal effects but then arbitrarily dismisses their health implications.

"Some bioeffects have been observed at moderate exposure levels (much higher than exposures from mobile phone towers) where tissue heating is apparently not involved and which cannot be explained by current knowledge on the physics of radiation/tissue interactions. Available evidence does not provide the basis to conclude that there are any adverse health effects arising from these 'non-thermal' bioeffects."

How can this statement be justified given the previous statements from Dr. Ross Adey, the ICNIRP and the US EPA? Even the preamble to the original Australian RF/MW Standard 2772 - 1985 disagrees with the DOCA fact sheet statement.

To quote: "It has been demonstrated that low-level, long-term exposure can induce a variety of effects in nervous, haematopoietic and immune systems of small animals. Such exposure may influence the susceptibility of animals to other influencing factors. Thermal mechanisms seen inadequate to account for these and other effects."

On another DOCA fact sheet Government action on electromagnetic energy public health issues, under the heading of 'Research', we again have the much repeated sentence: "The weight of national and international opinion is that there is no substantiated evidence" and "The continuing development of communications technology and improved scientific methods means that ongoing research ensures that public health policies continue to be based on the most up-to-date information."

There is more that could be said about these fact sheets, such as how they refer to the Australian RF/MW exposure Standard as providing protection, when this standard is for high level thermal effects only and not for low level chronic exposures. However it is sufficient to finish off with a quote from Dr. John Goldsmith, author of Epidemiological Evidence of Radiofrequency Radiation (Microwave) Effects on Military, Broadcasting and Occupational Studies (1995).



"There are strong political and economic reasons for wanting there to be no health effect of RF/MW (radiofrequency/microwave ) exposure, just as there are strong public health reasons for more accurately portraying the risks. Those of us who intend to speak for public health must be ready for opposition that is nominally but not truly, scientific."

## Article 8

# NSW Local Government concerns over Federal telecommunications policy

NSW Local Government Association president voices concerns on Federal Govt. telecommunications policy.

On March 4, 1997, the Australian Institute of Environmental Health, NSW Division, the Australian Institute of Building Surveyors, NSW Chapter, and the Local Government & Shires Associations held a one day seminar, titled 'Electromagnetic Radiation In The Environment: A Balanced view'.

The opening address of this seminar was given by Councillor Peter Woods, President of the NSW Local Government Association. In his opening remarks, Cr. Woods expressed both his association's concerns and those growing in the general community, as to the impact of telecommunications on the community.

His address is reproduced here in its entirety:

"The NSW Local Government Association and the Australian Institute of Environmental Health are delighted that you are able to join us for today's conference on electromagnetic radiation. We are particularly pleased to welcome our speakers, including Dr Neil Cherry who has travelled from New Zealand for the occasion. Thank you to the Australian Institute of Environmental Health for your co-operation with this conference, particularly to Loloma Wren, who has adeptly handled the enormous responsibility of organising the event.

This conference is particularly timely. Electromagnetic radiation is an issue of increasing public concern as communities react strongly to the monstrous web of overhead wires and cables that adorn our streets and to the unchecked proliferation of telecommunications towers.

People are angry. Aerial cables, powerlines and telecommunications towers spoil the appearance of their streets, devalue their properties and may even threaten the health of their families. This anger is being expressed in the form of picket lines, protest meetings, legal action and in the formation of countless action groups.

Public concern about power lines is not new. Both Australia and overseas the community has taken strong action against proposed power lines. Perhaps the most well-known example is the Brunswick to Richmond protest to a proposed 220 KV overhead powerline which was intended to run through Melbourne's inner suburbs. After a five year community campaign the line was eventually undergrounded. Less successful but just as vigorous was the protest against a high voltage transmission line from Mount Piper to Marulan which ended up in the Land and Environment Court. Closer to home, residents campaigned for almost five years for modifications to a high power transmission line from Spring-wood to Winmallee and Warumu.

The original proposal for 2 lines at 66 KV and a new substation was finally amended to one line at 22 KV.

As a result of public concern, a report on high voltage power lines was conducted by Sir Harry Gibbs who recommended that power authorities adopt a policy of "prudent avoidance". This policy has been embraced by the Australia's peak power group, the ESAA.

Public concern about telecommunications towers is - like the technology itself - a recent phenomenon. Many people believe that the low level (athermal) radiation they emit poses a serious health risk and cite a number of scientific studies in support of their argument. The Government and telecommunications carriers, on the other hand, maintain that the facilities must be safe because they comply with the Australian Standard (AS2772.1) and the only conclusive proof for health problems is at higher (thermal or heating) levels of radiation.

Whereas power authorities are subject to Federal, State and Local Government laws, telecommunications carriers have not been.

Over the last 12 months the community has taken a number of significant initiatives on the issue of EMR. In March 1996 EMRAA (Electromagnetic Radiation Alliance of Australia) was established to meet the growing need for information and advice to provide a network linking concerned people. Melbourne Cables Down Under was followed by Sydney Cables Down Under, then Sutherland Shire Cables Down Under, with plans for a national organisation under way. Two national journals specific to EMR have appeared: EMRAA News and Electromagnets Australia/New Zealand.

And public concern about EMF is clearly reaching the Federal Government.

In October last year the Minister, Senator Richard Alston, issued a press release announcing a \$4.5 million package for the issue of electromagnetic radiation and health. The package will contain three elements: public education, support for the World Health Organisation and research.

The public education campaign may be the first of these to materialise. Some sources suggest that this is really little more than an advertising campaign aimed at persuading the public that electromagnetic radiation does not present a health problem, which is the official line of the Department of Communications and the Arts. We will soon see.

The seconded area to be funded is the World Health Organisation's five year study into the biological effects of athermal radiation. However, the World Health Organisation and its Chairman, Dr Michael Repacholi, have taken the strong view that electromagnetic radiation does not cause health problems. In fact, Dr Repacholi even pursued this line at the end of a recent conference during which speaker after speaker had claimed that there are biological effects! This does cast some doubt over the impartiality of the WHO!

Lastly, funds are earmarked for research into the EMR and health. To this point much research into the health effects of EMR has been funded by telecommunications carriers or electricity supply authorities. This raises serious questions as to the reliability of the results. The LGA would like to see funds for research distributed by an independent panel comprising local

government and community members. In this way, the public could have far more confidence in the findings.

A sceptic might be tempted to regard the Government's \$4.5 million package as a desperate attempt to turn aside community wrath. At least two components: the public education program and support to WHO seem to be designed to placate the community... to convince us that there is no risk to public health and safety from the telecommunications industry.

And the Government may well hope it works!

In January two new documents appeared that will change the way the telecommunications industry is regulated in Australia. The new Telecommunications Code is already in force and a package of Telecommunications Bills will be debated in Parliament in March and should be enacted by the end of June when the industry is deregulated.

Even the way these documents were launched shows that the Government has scant regard for community opinion. Both appeared during the busy December/January period. They were not widely advertised. There was very little time allowed for public submission and the Code was finalised one day after submissions were due. This means that either AUSTEL employs an impressive array of speed readers, or that public opinion was totally ignored!

Together the new Telecommunications Code and Telecommunications Bills entrench the rights of carriers over those of the community. Again.

Some of their provisions are as follows:

The bills provide for the entry of new competitors in the telecommunications market after July 1. This will mean that we will see more carriers, more mobile phone towers and more cables.

The bills provide for the establishment of new regulatory authority for the telecommunications industry, the Australian Communications Authority (ACA) which will be formed by merging AUSTEL and Spectrum Management Agency. The ACA will have the power to arbitrate in disputes between a carrier and the public, State Government or Council. The bills list a number of considerations that the ACA must take into account in arbitrating such disputes. But these do not include the health concerns that feature so strongly among the community's complaints.

From July 1, carriers will be subject to State Territory laws unless, that is, the states try to contravene the will of the carriers! In the event of a dispute, the ACA will be able to provide a carrier with immunity from state laws.

There will also be a number of other significant immunities from state and territory laws. Low impact facilities - which haven't yet been defined - will be immune, so that carriers can obtain quicker approvals. This could mean that a mobile phone tower - on which several carriers are co-located - does not need to be approved!

Maintenance activities will also be exempt from state laws. This means that facilities can be altered and replaced without approval. Effectively, a carrier could increase the capacity of a mobile phone tower without notifying any authority or the surrounding community. This exemption will also allow carriers to lop vegetation without approval.

The telecommunications bills also provide for a "Ministerial Code of Practice" to be devised. However, they do not specify what this Code would contain or whether the public would be consulted in the process of setting it up. This Ministerial Code opens the way for a Minister to authorise a facility without any controls or public consultation.

At first reading, the bills seem to provide relief from the spectre of more uncontrolled aerial cabling. They state that after June 30, all cabling must be installed underground (unless subscribers agree to overhead installation) and that a working group will be set up by the Minister to consider under-grounding cables and other utilities.

However, the Telecommunications Code provides the carriers with immunity for an extra three months - ie till September 30 - by which time aerial cabling could well be complete in the majority of Australian cities. Another convenient loophole for the carriers is that cables of less than 1.3 mm will not be required to be undergrounded.

The bills provide stricter requirements on carriers to co-locate facilities in order to overcome shortage of suitable sites. If mobile phone towers are classified as 'low impact' facilities, they could be installed at existing sites without consultation or approval and this would increase the radiation levels to which the surrounding community is subject.

In their present form the bills give precedence to a national communications network over public health. They concede no risk from electromagnetic radiation and require carriers to comply "with recognised industry standards". However, as other speakers will point out, there is considerable evidence that the Australian Standard AS2772.1 is quite inadequate to protect public health. Finally, the bills aim to make additional spectrum available to carriers at the earliest opportunity. This presents us with the frightening possibility of yet more electromagnetic radiation from yet more sources with little regard for community health.

It is my firm opinion that as long as the Federal Government continues to subordinate the rights of the community to those of industry, public anger and resentment will continue to mount. People will not continue to endure the denial of their democratic rights. They will not stand idly by while the health of their families is jeopardised.

It is most certainly in the best interests of the Federal Government and industry to consider the wishes of the Australian public and to involve them in decisions about the telecommunications and power industries. Without participation in the planning and decision making process, the public will have little confidence in the outcomes and anger is likely to be vented in protests such as the ones I have mentioned.

In the absence of any credible leadership from the Federal Government on this issue, it is falling to councils across Australia to take a stand to protect the community.

As a result of public pressure, councils are implementing planning policies for the location of mobile phone towers. These policies aim to achieve the desired results for carriers while minimising the health risk to residents.

This sort of precautionary approach is essential given the risk of this new technology has not yet been fully explored.

It is an approach that could well be emulated by the Federal Government."

Cr. Peter Woods.



## Article 9

### **EDITORIAL More on concerns raised over new National Code**

Starting on July 1, 1997 a new Telecommunications National Code will take effect which will govern the conduct of the telecommunications industry. There have been concerns expressed from many sectors of the community as to the implications of the new Code. Most importantly, despite assurances to implement proper planning processes from July 1, the Federal Government has included "transitional provisions" to ensure telecommunications infrastructure is largely in place before the new Code takes effect.

·The roll out of aerial cabling will continue under the existing exemptions from local, state and Territory environmental and planning laws until September 30, 1997.

·The construction of mobile phone base stations (towers) that have substantially been completed by June 30, 1997 will also continue to be exempt until December 31, 1997.

Under the present Code, responsibility for regulating the installation of telecommunications facilities has rested with the federal government, with exemptions from local, state and territory planning and environmental laws. Instead the carriers only have to comply with the existing Code.

Because there is no requirement to consult with communities under the old Code, telecommunications infrastructure roll-out has gone on with virtually no input from affected communities.

The exemptions from democratic principals, for the benefit of corporate interests over community rights and community concern over possible long term adverse health effects from mobile phone base stations, has resulted in growing community and local government opposition.

So how will the new Telecommunications Code affect communities? To answer that question the Australian Local Government (ALGA) on 14 February 1997 released an analysis of the new Code and how it compares to the old.

Following are some excerpts from the ALGA's analysis which reinforce the previous article (p12).

## Notification and Consultation:

"The new Code still fails to provide an adequate process for consultation and dialogue between Councils, the community and carriers, but rather a token process which a carrier must undertake in certain circumstances, without any real obligation to respond to community concerns.

The procedures for notification under the new Code are inadequate, with carriers obliged to place an advertisement only in a major daily newspaper, rather than local newspapers which are received by all local residents.

Of particular concern under the new Code is Clause 25(1) which does not allow councils to notify the community about low impact proposals.

Clause 20(4) is also of concern as it offers no indication as to how the particular significance of areas to indigenous peoples is to be established, when in most instances they would not be notified of proposals due to the low impact classification in rural areas.

Consultation, in the sense of a meeting with the community, is only required in the case of high impact facilities. Otherwise the public can only make written submissions. There is no requirement for face-to-face discussions with councils. Timeframes for community consultation and notification are too short. Carriers are only obliged to undertake community consultation once on any proposal. This is unacceptable if significant changes are made to a proposal following initial consultations.

In all instances carriers are not required to provide information to the relevant authorities if it is of a confidential commercial nature or relates to the security of the network, unless they receive a written undertaking that this information will not be divulged. This provision could be used to withhold information needed for community consultation.

The notification and consultation requirements under the new Code raise serious concerns and do not provide Councils and the community with a real opportunity to engage carriers in debate and to promote local area planning.

## Information Requirements:

The information requirements under the new Code are nominally greater but remain inadequate and in some places contradictory. Another flaw relates to information requirements for low impact facilities. Carriers are not required to provide any environmental impact assessment, any statement in relation to noise and AS 1055, or to present all relevant plans and drawings. Schedule 3 further reduces the information required to the public, including in key areas such as alternative tower sites and the dimension of facilities.

### Alternative Tower sites:

The new Code enables Councils to propose two alternative sites for a proposed tower which must be considered by the carrier. However, carriers are free to reject these alternatives without close scrutiny of their decisions (except perhaps for high impact towers referred to the Environment Secretary).

Local Government's ability to influence the Carriers:

The new Code places a significantly higher number of requirements on carriers and authorities, ultimately without providing any real opportunities for Councils and the community to exert effective influence, let alone, control, over the installation of broadband aerial cabling or towers. The provisions of the new Code place a significant onus on councils in terms of time and resources.

The ALGA analysis overall conclusion on the new Code is that "Most of the changes included in the new Code under the guise of introducing a "stricter" regime are essentially cosmetic. In several key respects the new Code offers an easier path, provided they "go through the motions". Much activity will continue under the old Code anyway."

In addition, under the new Code, when negotiations between a council and a carrier are deemed to have broken down, the Australian Communications Authority (ACA) steps in to make a final decision. The ACA, formed by merging Austel and Spectrum Management Agency, will have the power to override State and Territory rules.

As far as the final decision on what type of facilities (towers) will be classified as "low impact" and therefore exempt from State/Territory laws, this is still to be decided and will be governed by a yet to be formed Ministerial Code of Practice. Essentially, the division between low, medium and high impact facilities is made purely on aesthetic grounds. The possible health hazards issue is totally ignored by both the old and new Codes.

For more independent information on the new Telecommunications National Code, please contact:

ALGA: John Wells on 02-9261 1381

Senator Lyn Allison's office on  
03-9416 1880

## Article 10

### **Swiss shortwave transmitter study sounds warning**

Review by Dr. Neil Cherry

**Study on Health Effects of the Shortwave Transmitter Station of Schwarzenburg, Berne, Switzerland (Major Report)**

#### **Background:**

A short wave transmitter was installed at Schwarzenburg, near Berne, Switzerland, in 1939. An star antenna was added in 1954 with three 150 kW outputs (6.1-21.8Mhz). and a 250 kW LOG PER antenna was added in 1971. The final transmitter is only used occasionally.

Since the Seventies, health complaints have been reported by the population in the surroundings of the transmitter, and associated with its activity. On the 2nd March 1990, a petition seeking a scientific evaluation of the health damage allegedly cause by the transmitter was handed by a group of inhabitants to the Swiss Federal Department of Traffic and Energy (SFDTE). In October 1990, the Head of SFDTE commissioned a study. It was carried out by 15 doctors and scientists, primarily from the University of Berne, but also from 4 other agencies. Their report, Altpeter et al. (1995), was published in August 1995.

Altpeter et al. (1995) carried out an extensive evaluation of health affects, using a carefully crafted health diary survey. They found significant changes is various indicators which increased with proximity to the mast and were significantly worse in elderly people. They included nervosity (restlessness), difficulty in falling asleep, difficulty in maintaining sleep, general weakness and joint pains, Figure 1.

Sleep difficulty was especially disturbing. This leads on to increasing fatigue and reduced feelings of well-being. Observed nocturnal sleep changes occurred in association with the nocturnal exposure levels in Table 1. Hence the sleep disturbance is associated with a maximum exposure of 1.85uW/cm<sup>2</sup> and a mean nocturnal Zone A exposure of less than 0.7 uAW/cm<sup>2</sup>.

People living in a mean RF exposure of 3.8 uW/cm<sup>2</sup>, which is about 100 times higher than an unexposed group, have a significantly elevated level of restlessness, sleep disruption, aches and pains and phlegm problems, all problems which were significantly worse for those aged over 45 years.

The following table lists the complaints which were significant with a probability of being random at less than the p=0.05 level between the three zones.

There is a clear trend for those over 45 years to show more significant reactions in association with increased shortwave RF exposure from the Schwarzenburg mast. The later six symptoms are added to those which already show a significant Odds Ratio.

The variables "Nervosity and inner restlessness", "General weakness and tiredness" and "Difficulties in falling asleep" are strongly related and therefore collapse into one variable, which could be termed "Chronic fatigue syndrome".

This study reveals statistically significant association between an extremely low intensity RF field (Zone A (High intensity) average = 0.236 uW/cm<sup>2</sup>) and a wide range of health and well-being variables. While this does not constitute "proof" of effects, in public health epidemiology, a statistically significant association which is not weakened by confounders, is sufficient avoidance action to be taken to reduce or eliminate the risk. Hypochondria was tested for and was not found.

### **Interim Conclusion:**

"Insomnias and joint pains, especially in the elderly, were more frequently reported in Zone A than in Zones B and C. They showed a dose-response relationship with the logistic regression and they were not related to a health-worry personality. Further studies are of need to establish a biophysical mechanism.



The Schwarzenburg Study was extended because of the significance of the initial findings. Melatonin secretion in people and cows was studied in relation to the sleep disorders identified, blood pressure was studied in relation to the health issues raised and the performance of school children was assessed in relation to brain disturbance indication such as difficulty in concentrating.

### **Sleep disturbance and melatonin:**

Sleep difficulty was especially disturbing. Significance was added to the association when the transmitter was turned off unexpectedly and unknown to the residents, in the middle of the study. Affected sleep patterns recovered until the transmitter was turned on again, when they deteriorated again.

Melatonin, a neurohormone produced by the pineal gland to regulate the daily sleep/wake pattern was studied in a sample of people, without finding significant changes. However, saliva melatonin concentrations from exposed cows showed a strong higher nightly peak level compared to the average when nightly peak which the transmissions were on. The overall median melatonin levels for the five tested exposed cows was 17.7 pg/ml (sd=1.25) while it was 19.0 pg/ml (sd=1.32) for the non-exposed ones. This exposed cows had lower melatonin levels but not necessarily significantly lower.

Lower levels of melatonin with exposure to RF radiation would be consistent with depressed nocturnal melatonin observed with ELF exposure, Reiter (1992). In other studies reduced melatonin has also been related to elevated incidence of breast cancer, Demers et al. 1 (1991).

### **Blood Pressure Reporting:**

A small number of inhabitants reported noticeable changes in heart beat (irregular, palpitations, pounding with effort). Individually these factors were not significant but they indicate a possible, more serious, health issue to do with stresses on the heart. The researchers therefore surveyed for blood pressure differences. When asked about their blood pressure only 55% in Zone Z and 56% in Zone B said they had normal blood pressure compared to 74% in Zone Z. The differences are significant at the  $p=0.01$  level. In addition, arterial hypertension was reported more frequently in Zone A (14%) than in Zones B (8.4%) and C (7.9%).

### **School children's performance:**

Rates of promotion of children in a school near the transmitter were compared with unexposed schools nearby. The number of school children at the highly exposed school is too small for conclusive studies of a probable effect of electromagnetic fields. However, the accumulated promotion from primary to secondary school since the 1950s, is lower in the exposed school than a control school. They conclude: "An effect of the transmitter is a possible explanation, but other influences including socio-economic differences cannot be excluded".

Hence a potential effect on children's performance does exist in association with the RF transmissions from the tower. This is consistent with human brain EEG disruption found by Von Klitzing (1995) and the reported symptom of "difficulty in concentration". "restlessness" and "difficulty of falling asleep" and "maintaining sleep", as reported by significantly more of the adults in Zone A compared to Zones B and C.

Conclusions:

This is a very significant study which records statistically significant associations, with dose-response relationships for many of the factors, factors which are fundamental to human health and well-being, which have adverse effects in association with increased RF shortwave radiation at mean and median exposure levels about 1000 times lower than the so-called "public safety standard". This proves the total inadequacy of the standard for protecting the public from the significant disruption to their health and well-being identified in this study. The authors of the Schwarzenburg Study conclude:

"Our results indicate a higher frequency of disorders of a neurovegetative nature among residents up to about 1000 m from the transmitter, and are highly suggestive of a direct effect of the radio shortwave transmitter on sleep quality".

#### **More on the Swiss Shortwave Transmitter study.**

In a letter to the New York based publication Microwave News, Dr. Josef Mayr, a Swiss consultant in electromagnetic compatibility, points out that that the actual risks may have been understated in this study. His letter is partly reproduced as follows:

"The objective of the study was to find possible relationships between RF/MW exposures and health problems - not between living in certain zones and health problems. Why then did the researchers present nearly all the results in terms of the geographic zones?"

Given such misclassification of exposures, much stronger correlations between RF/MW radiation and health problems - for example, irritability, headaches, tiredness and sleep problems - would have to be expected, if the study population had been classified according to field strengths rather than geographic zones. In the meantime, it has been announced that researchers will take a new look at the data and the conclusions.

Nevertheless, the results of the study are sensational. In a May 29, 1996, letter, an expert group at the Swiss Federal Office for Environment, Forests and Landscape (known by its German acronym, (BUWAL) admitted that severe sleep disorders were correlated with RF/MW exposures, even though the IRPA limits were never exceeded.

Sleep disorders and the other complaints reported in the study may seem innocuous compared to the cancers reported in other epidemiological studies. But if such disorders remain for years their long-term effects could be quite serious, particularly among children and the infirm.

The lesson of this study is that the safe level of RF/MW radiation exposure should be lowered to those found between zones B and C. This implies a reduction from IRPA's 0.2mW/cm<sup>2</sup> (200uW/cm<sup>2</sup>) to approximately 0.002uW/cm<sup>2</sup> - a reduction by a factor of 100,000.

Another important conclusion is that the grounds on which the IRPA recommendations are based (i.e., neglecting non-thermal effects) are entirely wrong. Exposure limits for low-and high-frequency electromagnetic fields and radiation (0Hz - 300GHz) should be revised." (Microwave News, Sept/Oct 1996, page 14)

## Article 11

### ●PLEASE NOTE:

There are two distinct areas of the electromagnetic spectrum covered in this publication:

1. The powerline frequency range of 50 or 60 Hertz (cycles per second) which falls in the extremely low frequency (ELF) range of the electromagnetic spectrum, which ranges from 1 to 300 Hz. [Electromagnetic Fields] In this range electric fields are measured in Volts per metre (V/m) and magnetic fields in Amps per metre (A/m). The magnetic portion, referred to as the magnetic flux density is measured in units of either Tesla or Gauss. For fields normally encountered in the environment units are in milli-, micro-, or nanotesla (mT, uT, nT) or if in units of Gauss, in milliGauss.(mG)
2. The radio and microwave frequency range (RF/MW). For radio frequency, this is 100 KiloHertz (KHz) to 30 MegaHertz (MHz). The microwave (MW) range spans from 30 MHz to 300 GigaHertz (GHz). [Electromagnetic Radiation] The usual unit of measurement for this range is for the power density level, expressed in units of watts per square metre ( W/m), milliwatts/cm sq. (mW/cm.sq.), or micro Watts/cm sq. (uW/cm/sq. Another unit is the Specific Absorption Rate (SAR) expressed as Watts/kilogram (W/k), which is the rate at which RF/MW radiation is absorbed in body tissues. The rate of absorption varies with frequency and body size but it is possible to determine approximately what intensity of the power density level produces a certain level of heating in the body.