

## CHAPTER 2

### HEALTH AND EMF

*Term of Reference 1 (a) (I) ...the possible impact of the power line and the accompanying land resumptions on the health of people and animals in surrounding areas, with particular reference to the likely effects of electromagnetic field radiation!*

#### Introduction

2.1 Electromagnetic fields (EMFs) are found everywhere there is electricity. Concerns about them centre on the potential for very strong fields to cause health effects in people exposed to them long periods or time or at high intensity for shorter periods. Groups of people thought to be at risk include power industry workers and people living close to voltage power lines.

2.2 Over the last 25 years a considerable amount of scientific research has been directed at determining the level of hazard posed by EMFs. This has included both epidemiological studies (patterns of disease in groups of people) and laboratory studies on animals and human volunteers. The results of scientific research on the effects of EMFs on health are equivocal: many studies have been conducted that have found no links between high levels of exposure or proximity to power lines, and health effects, while other studies have reported statistical links. In the meanwhile, power utilities have adopted a policy of 'prudent avoidance' when building new electrical facilities.

2.3 However, regardless of the state of scientific evidence, there is a perception among some sections of the public that there are health risks associated with exposure to strong EMFs. In particular, many people who live along the proposed Eastlink high voltage power line are convinced that there are dangers associated with them and therefore do not want Eastlink to be constructed on or near their properties. People are also concerned about the perceived risk to farm and native animals living near the power line, especially stud breeding stock.

#### *Electromagnetic Fields*

2.4 There are two different types of fields produced by electrical equipment and appliances: electric fields and magnetic fields. An electric field is an invisible force that relates to voltage, or the pressure under which electricity is forced along wires. Electric fields are present in any appliance plugged into a power point which is switched on, regardless of whether the appliance is turned on or off. Electric fields are strongest close to their source, but their strength rapidly diminishes as distance away from the source increases. They are blocked by many common materials such as wood or metal. Electric fields are measured in volts per metre or kilovolts (kV) per metre.

2.5 A magnetic field is an invisible force which is produced by the flow of electricity (commonly known as the current). Unlike electric fields, magnetic fields are only present when the electricity is on and the current is flowing. The strength of the magnetic field depends on the size of the current and they also decrease rapidly as distance away from the source increases. Magnetic fields are usually measured in milligauss, but are sometimes measured in gauss, teslas and microteslas (10 milligauss equals 1 micro tesla). Unlike electric fields however, magnetic fields are highly penetrative and difficult to shield.

2.6 Like all other electrical equipment, transmission lines produce both electric and magnetic fields. With power lines, the strength of the electric field varies with the operating voltage of the line and the strength of the magnetic field is related to the amps, or current flowing in the line. Field strengths are also related to the height of the lines, their geometric arrangement and the arrangement of the phases in multi-circuit lines.

#### Scientific Research

2.7 The question of whether EMFs can detrimentally effect biological systems has been addressed by many scientists over the last twenty years, with studies ranging from in vitro laboratory experiments on single cells to epidemiological studies on large populations. There are many thousands of primary research papers published in peer-reviewed journals, meta-analyses of groups of similar studies, and over 70 comprehensive secondary reviews carried out worldwide by professional committees and panels.

2.8 In undertaking this inquiry, the Committee has used evidence presented to it from the power authorities, from people living in the regions affected by Eastlink and from expert scientists who made representations to the Committee. The Committee has also made reference to some of the major reviews carried out by government sponsored bodies over the last decade in Australia and overseas.

## Secondary Reviews of EMF Research

### *Australian Reviews*

2.9 There have been two major reviews conducted in Australia - the Gibbs' Report and the Peach Panel.

2.10 The Gibbs Report, *Inquiry into Community Needs and High Voltage Transmission Line Development*, was commissioned by the NSW Government and was completed in 1991. In this very extensive inquiry, Sir Harry Gibbs sought evidence through submissions, hearings and inspections, reviewed scientific literature, and travelled overseas to meet with academic and government experts. He was assisted in technical matters by a panel of four expert scientists. The report considered both specific power line proposals in NSW and the general subject of EMI's and health.

2.11 In the report, Sir Harry Gibbs concluded:

It has not been established that electric fields or magnetic fields of power frequency are harmful to human health, but since there is some evidence that they may do harm, a policy of prudent avoidance is recommended. <sup>4</sup>

This statement has frequently been quoted and the expression 'prudent avoidance' is now very widely used.

2.12 At a similar time, January 1991, the Victorian Government established a panel to review public policy approaches in relation to power line fields and to make recommendations (the Peach Panel). In addition to recommending that the Government establish and maintain communication with the community about the subject, the Panel recommended a practical strategy based on prudent avoidance which was described as: 'looking systematically for strategies which can restrict field exposure and adopting those strategies which seem to be prudent investments given their costs and the level of scientific understanding about possible risks'. However, as noted by the Panel, a policy of prudent avoidance was not a 'health based policy' and that the implementation of the policy could not necessarily be seen as being of benefit to public health.<sup>5</sup>

### *Overseas Reviews*

2.13 There have been numerous overseas review of the potential health effects of EMFs. These have been conducted primarily in Britain, America, Canada, and Scandinavian countries. In 1992, an expert group under the leadership of prominent British epidemiologist, Sir Richard Doll, reported to the National Radiological Protection Board on *Electromagnetic Fields and the Risk of Cancer*, with the conclusion that:

... there is no clear evidence of a carcinogenic hazard from the normal levels of power frequency electromagnetic fields, radio frequency or microwave radiation to which people are exposed. <sup>6</sup>

2.14 In 1993 and again in 1994, the British National Radiological Protection Board reviewed studies in Scandinavia, Canada and France. Despite acknowledging that these studies had shown an association between increased likelihood of cancers and exposure to high levels of EMFs among children and among power industry workers, the Radiological Protection Board concluded that those studies did not establish that 'exposure to EMF is a cause of cancer', though they did acknowledge that 'they provide weak evidence to suggest the **possibility exists**'.<sup>7</sup>

2.15 Similarly, as quoted in submissions from both *Transgrid* and *Powerlink*, the vast majority of secondary studies conducted overseas have concluded that although EMFs have been implicated in primary studies, those studies have not contained sufficient convincing data to establish a causal relationship.

2.16 During the course of the Committee's inquiry, the draft conclusions and recommendations of a report written by the US National Council on Radiation, Protection and Measurements (NCRP) were leaked to the press and subsequently sent to the Committee. This report does not have any official status as it has not been subject to the normal peer review process. However, the report's major finding was that: 'In key areas of bioelectromagnetic 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'.<sup>9</sup>

2.17 A member of that Committee, Dr Richard Luben, gave evidence to the Committee. In discussing the report he stated:

I am a member of the council of the National Council on Radiation Protection -NCRP. This is a congressionally established body which advises the United States government on recommendations for safety standards for both ionising and nonionising radiation. As such, we are vested with the responsibility of determining the hazard level of a variety of environmental exposures.

I am also a member of subcommittee 89.3 of the NCRP, which is the committee that produced the document that has at least partially been leaked to the press and has been discussed widely. The committee that prepared the document is, as a whole, dismayed ... that the executive summary of our document has been released in this manner. It is a document that we spent 10 years writing. It consisted of over 800 pages of types material ...

However, I also want to point out that what was leaked is in fact the executive summary that was agreed to by the entire committee, and that there is no doubt in my mind that the report is finished. ... However, as a member of the NCRP Council and not as a member of the committee, I have to say that this document is still undergoing scientific review and ... that this document does not constitute any kind of recommendation or even the opinion of the NCRP council with regard to any non-ionising radiation exposure limits.

### **Power Authorities' Position**

#### *Transgrid*

2.18 In its submission, *Transgrid* stated that in considering health concerns about EMFs, it relied on reviews carried out by other bodies, such as those described above. *Transgrid* agreed with the conclusion that adverse health effects have not been established but that the possibility could not be ruled out, and that further research was needed. The Authority therefore monitors worldwide research, participates in the sponsorship of research through the Electricity Supply Association of Australia (ESAA), reviews practices in the light of research findings, measures field strength around its installations, takes 'prudent avoidance' into account in the siting and construction of installations and freely provides information to the public. In the case of Eastlink, two brochures were made available to local communities: *Electric and Magnetic Fields - Sharing Information* and *Your Guide to Understanding EilFs*.

2.19 The *Transgrid* submission accepts the Gibbs recommendation of 'prudent avoidance' but does so in the light of the qualification that 'it may be prudent to do whatever can be done without undue inconvenience and at modest expense

to avert the possible risk'.<sup>1</sup> The submission discussed the two aspects of power line construction which contribute most to EMFs (the physical dimensions of the structure and phasing arrangements) but concluded that because the final

technical and cost aspects of the line had not yet been assessed, it is possible at that stage to say what technical specifications would be used in Eastlink. However, the Authority proposed to acquire a 60 metre wide easement for the line 'which corresponds with to the typical width for) 30,000volt lines on which Sir Harry Gibbs statement was based'. The submission concluded that the: 'actions taken by the Authority are consistent with the notion of prudent avoidance'.

2.20 Modeling has been carried out to estimate the strength and degree of dissipation of electric and magnetic fields along the Eastlink transmission line. With respect to electric fields the *Transgrid* submission states. 'The maximum

electric field strength under average load conditions ... is approximately 3.2 kilovolts per metre (kV/m) under the line, decreasing to about 0.2 kV/m at the edge of the proposed casement, 30 metres from the centre of the line'. 14

2.21 With respect to magnetic fields the submission notes that because they depend on the current flowing in the line, which in turn varies with the load being supplied, there can be no single estimate as there is with electric fields. However, an estimate based on a maximum transmission load of 500mw results in a value of 46 milliguass (mG) directly under the line, decreasing to about 6.5 mG at the edge of the casement, 30 metres away.

2.22 The *Transgrid* submission points out that in many areas of Australia, and particularly in NSW, there are thousands of kilometres of transmission lines. Over NSW, there are about 530kin of 500kV lines, 4480kin of 330kV lines, 690kin of 220kV lines and 8,000kni of 1321cV lines, as well as about 300kin of underground cables predominantly located in the Sydney area; a total of about 14,000km.

2.23 After the Western Corridor was selected as the preferred line in February 1995, estimates were made of the number of dwellings which would be in close proximity to it. The *Transgrid* submission provides the following figures for the NSW sector of Eastlink:

Distance From Transmission Line	Number of Houses
0 - 250 metres	3
250 - 500 metres	23
500 - 1000 metres	58

Table 2.1 - Proximity of Eastlink power line to existing dwellings

2.24 *Transgrid* stated that the closest house is approximately 100 metres from the line and that many lines, particularly in urban areas, would have homes very much closer than this. The submission also noted that when the estimates for electric and magnetic field strengths at various distances away from the source are compared with the proximity of dwelling, there would be negligible effect on even the closest dwelling. 15

#### *Powerlink*

2.25 In its submission to the Committee, *Powerlink* stated emphatically that 'Trio causal link has been established' in any of the reviews of EMFs and health and that it had adopted the policy guidelines formulated by ESAA in this matter. The submission described how *Powerlink* had applied the concept of 'prudent avoidance' when selecting the preferred Western Corridor, and in narrowing that corridor to a specific route for Eastlink.

2.26 In the first instance, the concept of 'prudent avoidance' was applied to the process and thus population centres and larger townships were avoided. Then, according to *Powerlink*:

As corridor development proceeded ... prudent avoidance was applied progressively in more detail through each stage. ... Selection of the Preferred Alignment within the chosen corridor has applied prudent avoidance to the greatest level of detail, with proximity to individual houses in particular being considered. The outcome is an alignment which is no closer than 150 metres to any home - a distance at which fields from the transmission line will have reduced to approximately background levels.

2.27 The Electricity Supply Association of Australia (ESAA) takes a very strong view that no causal relationship has been established between EMIs and detrimental health effects. In both its primary submission and a supplementary submission, ESAA argued strenuously that a review of all the literature had shown that there is 'scientific consensus that health effects have not been established'.

2.28 The ESAA noted that public concern about EMFs arises each time a new transmission line is proposed and that this type of reaction is not confined to Australia, being a common experience in other developed countries. This reaction, ESAA suggested, was due to:

- fear due to lack of understanding of the nature of EMFs and their interaction with living things
- fear based on incomplete or inaccurate media stories, pseudo-scientific articles and books, and rumours
- frustration because people see themselves as being involuntarily exposed to an imperceptible agent which may endanger them or their children
- frustration that public health authorities can give no unequivocal guarantees that EMFs are perfectly safe.

2.29 In attempting to overcome this reaction, and in recognition of the fact that some members of the public are genuinely concerned about issues relating to EMFs and health, ESAA conducts employee and public education programs, publishes information brochures and newsletters and presents seminars and lectures on the issue. <sup>19</sup>

### **Community Concerns**

2.30 There is genuine fear among rural communities affected by the Eastlink proposal that electromagnetic fields will have long-term effects on the health of people in those communities, and in particular on children who may live in close proximity to high voltage power lines. A very large number of the submissions put to the Committee by individuals and community groups mentioned potential impact of the power line on health as a concern. This concern extended to the fear that because of the very long time frame of possible EMF effect, compensation would be difficult if not impossible to achieve. Analogies were drawn with other public health problems, such as with tobacco smoking, the herbicide DDT, asbestos and thalidomide, which were originally believed to be safe and were later proved not to have been. <sup>20</sup>

2.31 Quite a number of people who put submissions to the committee had themselves examined the overseas epidemiological literature and had quoted scientific surveys which had led to the conclusion that there did appear to be a relationship between EMIs and health risks, particularly childhood leukemia. <sup>21</sup>

2.32 Several submissions have suggested that there was mounting evidence that occupational exposure to high levels of EMFs may result in health problems. In particular, workers in electrical professions and telephone company employees, have been the subject of some studies and found to have a higher incidence of cancer, particularly lymphoma and leukemia. There is also some evidence that radiographers who are exposed to EMFs through their operation of X-ray units, may be at risk of health effects. While these operators are protected from X-rays, their work may bring them in contact with high and low voltage transformers, cables, circuitry and control panels. Train drivers in Queensland are another group of people who have expressed concern that their jobs are putting them at risk .

### *Criticism of the Concept of 'Prudent Avoidance'*

2.33 While power authorities argued a philosophy of 'prudent avoidance' of high voltage power lines, and thus the avoidance of exposure to ENIFs, people who live along the corridor pointed out that if the power line was to traverse their properties they would not be able to avoid, whether prudently or not, working under the lines, simply because their farm infrastructure or productive land lay beneath it. Individual submissions claimed variously that milking sheds, sheep dips, cattle yards, machinery sheds, cultivated paddocks and watering points, would be directly under the line, or within a short distance of it.<sup>25</sup> How, these submissions asked, were they to prudently avoid EMFs coming from the high voltage lines when they had to keep using these facilities?

2.34 One submission noted:

The proposed route traverses many smaller adjoining properties, as well as Ollera, with houses, sheds and stockyards at close proximity to each other. It would therefore be impossible to escape the electromagnetic radiation while going about one's daily business. We are totally opposed to any employee or member of the family being exposed to any radiation for long durations while working in either the cattle or sheep yards. The cattle facilities are used extensively and often cattle are held in a feelot situation. We are also opposed to our stock being exposed continuously to radiation as our cattle are sold onto the domestic market.

2.35 The submission then argued:

It would be almost impossible to relocate the Airstrip, sheep yards, or cattle yards that are within the Eastlink corridor as they are all relatively new facilities that now fit into the whole environment and the overall plan to update and streamline the entire management for the future prosperity for the next generation and managers of Ollera

2.36 In discussing the concept of 'prudent avoidance; Dr Liz Stringer, a medical practitioner from Warwick, noted that while this policy is widely recommended, there are no real guidelines to define this. She explained:

The National health and Medical Research Council has set "safe limits" for EMR exposure below which there should be no immediate or acute effects. These have no relevance to safe levels for long term exposure

### *Power Authorities and EMF Concerns*

2.36 People concerned about the health effects of Eastlink expressed frustration at the apparently *laissez faire* attitudes of the power authorities. Submissions argued that while the power authorities refused to acknowledge that there could be health risks involved with EMFs the whole subject would not be given serious consideration.

2.38 When concerns about the possible health risks of the power line had been put to the power authorities the reply had frequently been given that landholders would encounter more EMFs around the home than they would from the power lines. Yet landholders not that using electrical appliances in the home is a matter of choice. If Eastlink crosses their land they will have no choice. They will have to work beneath the power lines, sometimes frequently, sometimes all day. One submission noted: 'These power lines will emit more than 100 times more EMFs than our electrical appliances around the home.'

2.39 While there is no substantial proof that there are no risks, some people prefer to remain sceptical. They are mindful of the fact there is evidence that suggests that there might be a risk and that, if there is a risk, the consequences are indeed very serious. People with children, potentially the most vulnerable group, share a double concern.

2.40 The St Patrick's Presbytery submission commented: 'Our children are our most precious commodity and we would not wish to expose them to unnecessary risks, particularly to such devastating diseases as leukemia and brain tumours. The effects on young lives are too horrendous to contemplate'.

2.41 This submission also noted that in a recent decision of the Toowoomba Planning and Environment Court, District Court Judge Thomas Quirk ruled that the effect of EM17s on health was 'one of uncertainty but also one of considerable public concern' and the development application under consideration had been rejected because parkland would be located under the power lines. <sup>31</sup>

2.42 Gibbs himself came to the conclusion that it was possible that children exposed to extremely low frequency electric fields or magnetic fields were at greater risk of developing cancer. <sup>32</sup>

### *Stress Induced Effects on Health*

2.43 The very proposition that a high voltage power line should pass through or near people's properties has already had an effect on the health of those people. Since its announcement, the Eastlink proposal appears to have resulted in a high level of stress in the communities involved. People are genuinely distressed at the thought of the power line being built near them; they do not want Eastlink to be anywhere near their communities. Quite a number of submissions to the Committee were punctuated throughout, or ended with the statement: I SAY NO TO EASTLINK; or more simply: NO EASTLINK.

2.44 When Eastlink was first proposed, there were three main corridor alternatives, with a number of linking options. The corridors varied in width downwards from a maximum of about 11 km. Through the refinement process this zone was reduced to a 2-kilometre corridor. Thus from the outset, quite a large number of people were led to believe that the power line might impinge on their properties. This method, it was argued, placed considerable unnecessary stress on a large number of people and is still placing stress on those people who do not know whether the line will pass through their particular properties.

2.45 In one study of the stress effects of the Eastlink proposal on the health of a sample of people living within the Ma Ma Creek area of south eastern Queensland, the people surveyed attributed to Eastlink an increase in such stress

related symptoms as tension, headaches, palpitations, anxiety, poor sleep, and poor appetite in the adults. Feelings of hopelessness, helplessness, depression, anxiety and, most common of all, anger were also reported. The primary cause of stress was attributed to the fear that EMI7s may prove at some later stage to have been harmful. This study also described how residents in the affected region 'feel that there are social changes in their community over which they had no control and are fearful that they have lost the power necessary to make informed decisions about their environment'.

2.46 Dr Liz Stringer, a general practitioner who has consulted people directly affected by Eastlink, stated: ' Many families and individuals have already been stressed just by the prospect of Eastlink. ... stress and disease are very closely linked. Stress can undermine immunity. Stress can cause disease. Stress can kill. The stress and suffering caused by Eastlink are totally unnecessary.'

#### *Balancing Health Concerns With Environmental Concerns*

2.47 The need to ensure 'prudent avoidance' will increasingly conflict with the need to preserve high quality natural environments. Having now adopted a policy of 'prudent avoidance', power authorities will seek to keep the additional cost associated with this policy to a minimum. In order to practice 'prudent avoidance' at lowest possible cost, there will be a tendency for power authorities to put increasing pressure on non-urban areas, prime agricultural land and high quality natural environments.

2.48 The Australian Transmission Line Avoidance Society argued that there is an increasingly urgent need for power authorities to form policies, in the light of the need for 'prudent avoidance', so as to limit damage to high quality environments. Such policies would include the consideration of alternatives to projects such as Eastlink if the conflict between health and the environment could not be adequately resolved. The Society further argued that if any genuine attempt was to be made to resolve the Eastlink conflict, greater cooperation was needed between all groups involved, electricity authorities, state governments, local councils, and all interested members of the community. <sup>36</sup>

#### *A Question of Choice*

2.49 There are many places around Australia where high voltage power lines have already been constructed. People live near these lines and in new urban developments choose to live near them. Why then has such strong community concern been engendered by Eastlink? One submission suggested that the real source of grievance is the fact that landholders feel that Eastlink is being imposed on them with little or no opportunity to have any real say against it. Their land is 'freehold' but they do not have the option of deciding that the power line will not traverse their land.

2.50 This argument may have some merit, but it tends to overlook the very real concerns of the people affected by Eastlink. Choice is very important to all people and while it may be true that the inability to choose forms the basis of their objection to the imposition of Eastlink, secondary issues such as reductions in land values, destruction of the visual integrity of the landscape, physical impact on the natural environment and perceived health risks become so great as to make the question of choice irrelevant.

#### **Conflicting Scientific Views Presented in Evidence**

2.51 In an effort to clarify the issue of health effects of EMFs, the Committee heard evidence from a number of expert witnesses from both Australia and overseas. These witnesses included Dr Michael Repacholi, who was on secondment from the position of Chief Scientist at Royal Adelaide Hospital to the position of Chairman of the International Commission on Non-Ionising Radiation Protection (Institute of Radiation Protection, Germany), Professor Mark Israel, a paediatric oncologist at the School of Medicine of the University of California, and Dr Richard Luben, Associate Professor of Biomedical Studies at the University of California. Although all three witnesses appeared in a personal capacity, Dr Israel's travel to Australia had been sponsored by ESAA and Dr Luben's travel had been sponsored by the community group, Victorian Powerline Action.

2.52 Dr Michael Repacholi provided a comprehensive report to the Committee which gave details of his own and other research on the effect of electric and magnetic field on biological systems. His conclusion was that 'both the laboratory and epidemiological evidence does not support the case that residents would suffer any adverse health

consequences from exposure to 50Hz fields. ... the resident's exposure to 50 Hz fields from the proposed Eastlink power line would be well within current limits accepted internationally and by many countries'.<sup>38</sup>

2.53 In evidence to the Committee, Dr Repacholi stated:

It has been the work of my commission to assess the literature on a continuing basis because we publish international guidelines on exposure limits that we, on the basis w' the science, consider that people can be exposed to safely, based on the evidence that we have. We meet regularly to assess any new results that are coming out, to see if those results would alter the health risk assessment that has already been made, and, hence, have some implications for standards. To date, right to this day, there is no data that indicates that there should be change to the current international guidelines on exposure limits to the 50-60 hertz fields'.<sup>39</sup> He continued 'From a health viewpoint and from my constant assessment of this literature over a period of 20 years, I still have no fear of 50 or 60 hertz magnetic fields causing effects at the levels we are normally exposed to even from power lines.'<sup>40</sup>

2.54 Professor Mark Israel's evidence was consistent with the conclusion made by Dr Repacholi. He strongly opposed any suggestion that EMFs could initiate cancer in humans, stating:

Based on my education, experience, and training as a cancer researcher, medical doctor, and paediatric oncologist, and the available molecular, cellular and whole animal studies, I find no scientific basis for concluding that power frequency electric and/O1 magnetic fields induce or promote cancer or other adverse health effects. Using the accepted scientific criteria that we apply to carcinogenesis, I cannot find support for the notion that power frequency electric and/or magnetic fields can lead to the development of cancer.

2.55 Dr Richard Luben held an opposing view to that of Dr Repacholi and Professor Israel. While carefully clarifying the statement that there was no evidence that EMFs caused cancer, Dr Luben stated that there was strong evidence that there was a correlation between proximity to high voltage power lines and increased incidence of diseases such as leukemia in children. In his submission he stated: 'In my opinion, the epidemiologic literature indicates a low but repeatable correlation between proximity to high energy power lines and the incidence of human neoplasms, in particular childhood leukemia'.<sup>41</sup>

2.56 In oral evidence Dr Luben elaborated~

I have had a lot of experience in trying to evaluate the scientific validity of these documents. ... The correlation between power lines and leukaemia is statistically supportable. There are possible mechanisms based on both animal and laboratory results that suggest cancer causing or cancer promoting activities of electromagnetic fields. Combining the statistical association and the laboratory data with which I am most familiar because I work with it every day leads me to feel that there is some reason for caution.

2.57 When questioned by the Chairman, Senator Ferguson, as to how equally eminent scientists could come to such different conclusions, Dr Luben explained that: 'scientists of equal skill and equal dedication can look at the same body of evidence and come away with different points of view. It is similar to any other endeavour. ... two different people can come away with two different points of view based on their background, based on the particular set of information that they have been exposed to and the ways in which that information is translated into action in their own particular lives .

## **Effect Of EMFs On Stock And Crops**

### *Gibbs Report*

2.58 The Gibbs Report concluded that: 'The magnetic fields created by power lines do not affect the health or reproductive capacity of farm animals'<sup>44</sup> ; that 'from a practical point of view, the electric fields created by transmissions lines have no adverse effect on crops, pasture, grasses or native flora, other than trees, growing under or near to the lines'<sup>45</sup> and that 'No reason exists for concern as to the effect of the fields on animals or plants'. However, Gibbs did note that bee hives near power lines can be adversely affected and that the growth of trees under the line can be reduced by the effect of corona. However, Gibbs dismisses the later concern with the statement that the height of trees under power lines has to be restricted anyway to avoid interference with the line.

### *Community Concern*



2.59 Farmers are genuinely concerned that the high voltage power line proposed for Eastlink will have detrimental effects on their breeding stock. Many submissions commented to the effect that stud rams could become infertile and ewes abort their lambs. One submission stated: 'the link between infertility in livestock and exposure to high levels of ElvIR is one that many stud owners and farmers know from personal experience.

2.60 Because primary producers are continually seeking to improve efficiencies in farm production, any action that has the potential to reduce productivity (such as an increased rate of spontaneous abortion in livestock) may be considered by them to be unacceptable.

2.61 Concerned farmers suggested that cattle exposed to EkTs might be rejected by local and overseas markets in the same way that the European Community created trade barrier to cattle subject to hormone growth promotants and the American import beef market refused Australian cattle found to have high levels of chlorofluazuron residues. One submissions stated: 'We can well do without another threat to our beef industry ... we must have a written assurance from Eastlink that we will be satisfactorily compensated for losses of income should it subsequently happen that stock that have been subject to Electro-Magnetic Radiation become unsaleable'.

2.62 A submission from the group Lockyer Valley Against Eastlink commented: 'There are at least two stud Cattle farmers who ... cannot obtain insurance on their stock if the stock are grazed in the vicinity of the power lines' . Other specific concerns included apiarists, who believes that their hives were at risk, and organic growers who believed that they would lose certification should power lines be constructed on their property.

2.63 Opponents of Eastlink presented evidence from scientific studies on laboratory animals that indicated a possible health effect and concluded that if an effect on human health was possible, then it was reasonable to infer that reports were also cited of farmers there might be an effect on animal health observing reproductive disorders among dairy cows and 'scrambled eggs' laid by hens living underneath 765 kV power line in New York

## Conclusions

2.64 Of all aspects of the Committee's inquiry into the Eastlink proposal, the issue of potential health effects of EMFs far outweighed any other subject. At least one third of all the evidence taken by the Committee related to EMFs and almost all submissions from land owners affected by Eastlink mentioned this subject as one of great concern. The Committee accepts that many people hold genuine reservations about the impact that a high voltage power line may have on their health, and the health of their families. The Committee understands that these people choose to believe those scientific studies which suggest that they should be concerned about their health.

2.65 In attempting to resolve this issue from a scientific point of view, it became clear to the Committee that reputable scientists have taken strong stands both in support of and against the proposition that high voltage power lines may cause health effects in people living near them. The Committee suggests that these contradictory positions can partly be explained by the fact that the scientific literature on the subject is vast and that, because of the very nature of statistical analysis, varying interpretations can be made of both individual experimental results and meta-analysis of collections of experiments. Broad reviews of the literature can be biased, intentionally or unintentionally, by the availability of information, choice of scientific papers used, and inherent opinions of the reviewer.

**2.66 In the light of such conflicting evidence, and because it is not possible scientifically to prove a negative, the Committee is unable to totally dismiss the possibility that there may be adverse effects. Similarly, the Committee is unable to conclude that a definite link between high voltage power lines and adverse effects on human health exists and thus that any new policy recommendations need to be made.**

**2.67 However, the Committee is able to conclude that simply the fear of detrimental health effects, whether real or imaginary, is in itself having an impact on the lives of some individuals affected by the Eastlink proposal. In acknowledging these community concerns, the Committee takes a similar stand to that of the**

**Gibbs report. The Committee agrees that, as a minimum policy or until evidence suggests otherwise, the concept of 'prudent avoidance' should continue to be practiced by government and power authorities.**

2.68 However, in supporting this concept, the Committee also acknowledges that there are some difficulties with it as a policy with practical application, Firstly, people who own land through which high voltage power lines traverse may have difficulty in 'prudently avoiding' those lines while carrying out the normal activities that their farming enterprise requires. Where lines are proximate to facilities and cultivated paddocks, farm workers may have no choice but to work within the electromagnetic fields emanated by those lines, even if only for short periods.

2.69 Secondly, there are currently no guidelines for what 'prudent avoidance' means. There are safety standards for exposure to E1N4Fs but these do not readily translate to people living or working near high voltage power lines.

**2.70 The Committee therefore concludes that, in the case of Eastlink, 'prudent avoidance' should mean siting the line as far as possible from houses, outbuildings and other farm facilities.**

2.71 As with human health, the Committee accepts that evidence of power line impact on the health of stock and crops grown within the vicinity of the line is equivocal. Opponents of Eastlink presented evidence from scientific studies on laboratory animals that show a possible health effect and concluded that if an effect on human health was possible, then it was reasonable to infer that there might be an effect on animal health.

**2.72 However, in the absence of extensive field studies on livestock, the Committee is not able to conclude that high voltage power lines affect the health of livestock and crops nor is it able to conclude that they do not. The Committee therefore recommends that scientific studies should be carried out in Australia on the possible effects of high voltage power lines on stock and crops.**

2.73 Regardless of whether there is an actual effect or not, public perception that there might be an effect can have an impact on the market value of stock and crops produced in areas through which high voltage power lines pass. This may particularly be the case with certified organic farmers and with breeders of stud stock.

2.74 The Committee therefore concludes that compensation by power authorities should be extended to those property owners who suffer an economic loss as a result of the construction of Eastlink, regardless of how that loss is brought about.