

**WORKSHOP REPORT:
REVIEW OF ELECTRIC AND MAGNETIC FIELDS (EMFS)**

MARCH, 2001

MANITOBA CLEAN ENVIRONMENT COMMISSION
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1. INTRODUCTION

On November 15, 2000, the Manitoba Clean Environment Commission (CEC) received a request from the office of the Minister responsible for Manitoba Hydro (the Minister) to undertake an investigation of the potential human health-related effects that might be associated with electric and magnetic fields (EMFs) as emitted from transmission and distribution lines. This assessment of the health-related EMF issue was also to include the review of practices used in other jurisdictions in responding to EMF concerns. The CEC (the CEC Panel) directed and facilitated a process that addressed the Minister's request.

The initial intent was to conduct a literature review of the EMF issue. After considering this approach, the CEC Panel determined that a more appropriate and effective process would be to organise a workshop that would bring together public health officials and experts on EMF (the Experts) to review and discuss the potential human health-related effects of EMF. Accordingly, on January 25, 2001 the Commission convened an Experts Workshop to provide a forum in which to discuss the human health effects of EMFs and to determine if any conclusions could be drawn from the extensive studies and research that has been conducted on this issue over the past 30 years. In addition to public health and EMF experts, the Workshop was attended by three Commission members along with representatives from both Manitoba Hydro and Manitoba Conservation who served as a technical resource to the CEC during the Workshop.

This report outlines the findings of the EMF Workshop and is supplementary to the report entitled, "Electric and Magnetic Fields (EMFs): Health and EMF Experts Consensus Statement" (CEC 2001).

1.1 BACKGROUND

Electric and magnetic fields (EMFs) occur naturally and as a result of the generation, delivery and use of electric power. EMFs are fields of force created by electric voltage and current. The earth has natural electric and magnetic fields.

Electric fields emanate from electrical appliances and from their power supply cords. Electric fields are a function of the voltage on a conductor and can exert a force on charged objects near

them. The strength of electric fields is typically measured in volts per metre (V/m) or in kilovolts per meter (kV/m). The strength of an electric field decreases significantly with increasing distance from the source.

Magnetic fields result primarily from the motion of the electric charge or current, such as when there is a current flowing through a power line or when an appliance is plugged in and turned on. Magnetic fields are typically measured in tesla (T) or in gauss (G) and milligauss (mG). One tesla equals 10,000 gauss and one gauss equals 1,000 milligauss.

The EMF from power lines and appliances are of extremely low frequency (ELF) and low energy. They are non-ionizing and are markedly different in frequency from ionizing radiation such as X-rays and gamma rays. Extremely low frequency electric and magnetic fields (ELF-EMFs) do not have enough energy to heat body tissue or cause ionization, i.e., form charged particles that could more readily be absorbed by biological matter.

Over the past 30 years, questions have been raised about the possible human health-related effects associated with exposure to EMFs from electric power lines, home wiring and electrical devices such as appliances, televisions and computer monitors. Numerous studies and investigations have been undertaken in an attempt to define possible human health-related effects.

2. APPROACH

Initially, in determining the most appropriate approach to the investigation of the possible human health impacts associated with exposure to EMFs, the CEC considered conducting a literature review to examine the state of the scientific debate on the matter. Currently, there are an estimated 27,000 reports and publications respecting EMF. Given the volume and technical complexity of the material the Commission determined that its proper interpretation would require the involvement of experts that work in the fields of public health and EMF research.

After discussing the overall scope and limitations associated with a literature review, the CEC determined that the convening of an Experts Workshop to consider the EMF issue would be a more efficient and effective process through which to achieve a practical understanding of the topic. It was also reasoned that such an approach would facilitate the preparation of a useful interpretation of the issue for government. Accordingly, the Commission convened such a Workshop on January 25, 2001 (ref. Appendix A).

The focus of the EMF Workshop was to discuss “the state of the debate” on EMF and, if appropriate, to develop an Expert’s Consensus Statement on the issue of human health-related effects of exposure to EMFs from electrical transmission and distribution lines. Mr. Terry Duguid, Commission Chairman, acted as a facilitator for discussions that occurred at the one-day Workshop. Dr. Jack Mandel, a recognised expert in the EMF field of study, gave a presentation and interpretation of the potential human health-related effects of exposure to EMFs. His presentation was based on the findings of 30 years of studies on the topic by various researchers and 20 years of personal involvement in the field.

The Workshop participants also considered the guidelines respecting EMF exposure as established by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), as provided by Dr. Johnson of CancerCare Manitoba. This presentation was intended to provide a basic understanding of the ICNIRP guidelines and an interpretation of how they potentially apply to Canada and, more specifically, to Manitoba.

The practices used in other jurisdictions to respond to EMF concerns were also discussed at the EMF Workshop. This included a report on the findings of a TetrES Consultants Inc. telephone survey respecting the various strategies developed across Canada in response to EMF issues

and concerns (ref. Appendix B). (EMF policies in the U.S.A. and select European countries were explored through a review of existing information, but not through phone surveys.)

The majority of funding for this investigation was provided by the Clean Environment Commission. Pursuant to Environment Act Regulation 210/92, the Commission sought cost recovery from Manitoba Hydro to secure the services of Dr. Mandel. Manitoba Hydro played no role in the selection of any of the Experts who attended the Workshop, including Dr. Mandel.

3. WORKSHOP PARTICIPATION

The Experts Workshop convened by the CEC involved a number of public health officials and EMF Experts. Various technical and administrative staff were also in attendance along with three members of the Commission.

Health and EMF Experts

Dr. Jack Mandel, Vice President, Exponent Health Group Inc.

Dr. Harry Johnson, Department Head, Imaging Physics & Radiation Protection,
CancerCare Manitoba

Dr. Margaret Fast, Medical Officer of Health, Winnipeg Regional Health Authority

Dr. Jim Poplow, Manitoba Officer of Health, Public Health Branch, Manitoba Health

Clean Environment Commission

Terry Duguid, Chairman

Gerard Lecuyer

Ian Halket

Technical Resources

John Chan, Section Head, Transmission Design, Manitoba Hydro

Brian Blunt, Environment Officer, Land Conservation Use Approvals, Manitoba

Consulting and Support Staff

George Rempel, President, TetrES Consultants Inc.

Blair McMahon, Senior Biologist, Associate, TetrES Consultants Inc.

Shaun Loney, Special Assistant, Minister Responsible for Manitoba Hydro

James Potton, CEC Technical Advisor

Rory Grewar, Commission Secretary

4. EMF WORKSHOP AGENDA AND DISCUSSION

4.1 OVERALL AGENDA

The EMF Workshop was organised to include a series of presentations, followed by a general discussion leading to the possible development of a consensus on the interpretation of the information presented at the Workshop. The meeting agenda covered the following:

- Introduction – an opening to the workshop was provided by Terry Duguid, Chairman of the Manitoba Clean Environment Commission (CEC);
- Context for review of EMF Today – presentation provided by George Rempel of TetrES Consultants Inc.;
- EMF: A public health overview – presentation provided by Dr. Jack Mandel of Exponent Health Group Inc.;
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) – presentation provided by Dr. Harry Johnson of CancerCare Manitoba;
- Review of experience: How jurisdictions deal with EMF concerns – presentation provided by Blair McMahon of TetrES Consultants Inc.;
- Discussion/Consensus: Observations and recommendations;
- What's next; and
- Closing Comments – provided by Terry Duguid.

Open-ended discussion, with questions and answers, occurred following the presentations. The presentations are provided in Appendices C through F. Relevant discussions relating to each of the above-mentioned agenda items are provided in the following sub-sections.

4.2 OPENING

Terry Duguid gave the opening remarks, welcoming those in attendance. He gave some background on the Manitoba Clean Environment Commission, and indicated that the CEC provides advice and recommendations to the Province of Manitoba with respect to many

activities, including the following:

- public hearings for environmental licenses, e.g., major proposed developments;
- environmental mediations;
- issues investigation, e.g., the current human health-related EMF issue; and
- public education programs, e.g., the recent climate change forum.

Mr. Duguid indicated that the purpose of this EMF Workshop was to address the questions asked by the office of the Manitoba Minister responsible for Manitoba Hydro (the Minister) and in so doing reflect the current state of the debate on the potential human health-related effects that might be associated with electric and magnetic fields (EMFs). Since the Minister also requested an identification of practices used in other jurisdictions to deal with EMF concerns, information in this regard would also be included in the Workshop process.

Mr. Duguid indicated that, following the EMF Workshop, a Manitoba Clean Environment Commission report would be written and provided to the Minister.

4.3 CONTEXT FOR REVIEW OF EMF TODAY

George Rempel provided a presentation (ref. Appendix C) that gave a perspective on the following topics:

- electric power generation and distribution - in general and with respect to proposed development in Manitoba;
 - definition of electric and magnetic fields;
 - typical magnetic field strengths in Winnipeg;
 - electric and magnetic field strength along and near transmission line rights-of-way and how EMF exposure levels are typically well below the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guideline limits outlined in Section 4.5;
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4.4 STATUS OF EMF RESEARCH: A PUBLIC HEALTH OVERVIEW

Dr. Jack Mandel provided a presentation regarding the potential human health-related effects that might be associated with EMFs. Dr. Mandel is a Group Vice President at Exponent Health Group Inc., primarily responsible for directing the nationwide operations of the health and environmental practices of the firm. Dr. Mandel has been a member of the University of Minnesota faculty since 1975. From 1995 to 1999, he was the Head of the Division of Environmental and Occupational Health in the School of Public Health at the University of Minnesota. Dr. Mandel has conducted many case-control, cohort (both prospective and retrospective), cross-sectional, experimental, and methodological studies. He has published more than 100 articles related to epidemiology, including studies of prostate, colorectal, kidney, pancreatic, breast, lung, stomach, haematopoietic and skin cancers. These studies have evaluated a variety of potential causes for illness due to exposures through occupation, radiation, pesticides and other chemicals, hormones, medications, diet, alcohol, and tobacco, as well as other lifestyle factors.

Dr. Mandel explained that although extensive studies addressing the possible effects of exposure to EMFs have been conducted over the past 30 years, interpretation of the results have often provided a "mixed message" regarding the presence or absence of a causal link between extremely low frequency (ELF) electric and magnetic fields (as produced by electric power distribution and transmission lines) and any potentially adverse effects on human health. Dr. Mandel provided an overhead presentation of more than 60 slides (ref. Appendix D) that included a description of the origin of the EMF concerns (i.e., studies by Wertheimer and Leeper [1979], and Savitz *et. al.* [1988]), as well pertinent information described below in summary.

4.4.1 Scientific Methods for Evaluating EMFs

- the role of science in public health, regarding the investigation and interpretation of studies, including assessment of limitations;
 - the manner in which scientists test predictions relating to EMFs with respect to epidemiologic studies in humans, laboratory studies in animals, and studies of cells and tissues; and
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- epidemiology studies to compare characteristics of people with/without a disease:
 - individual characteristics modifying the effect of environmental factors;
 - a definition of statistical association and confounding factors;
 - studies of residential exposures from power lines and of electrical workers; and
 - the serious methodological errors that have been made in several key studies used by some for rationalizing a causal link between EMF and cancer.

4.4.2 EMF Research Findings

- recent studies that support the conclusion that there is no demonstrable causal association between leukemia and wire codes;
 - the NCI (National Cancer Institute) study of over 600 cases (i.e., individuals tested in the study) in 9 states that showed no demonstrable causal association between EMF and childhood leukemia for any exposure method (Linnet *et al.* 1997; Kleinerman *et al.* 2000), regardless of wire coding, distance, exposure index, and measured dose. There was a positive association for .400-.499 μ T in 10 cases and 2 controls;
 - the NCI conclusions that there was no demonstrable causal effect of EMF in promoting cancer;
 - the results of McBride (*et al.* 1999) study that support the conclusion that there is no causal effect of EMFs on the risk of childhood leukemia;
 - the conclusions of Green *et al.* (1999) that wire coding is not related to increased health risks from EMFs but that the results suggest an association between magnetic fields (MFs) and risk of developing childhood leukemia:
 - several methodological problems exist for that study, e.g., case and control selection, confounding factors considered, etc.;
 - the United Kingdom Childhood Cancer Study (UKCCS) study by Sir Richard Doll (UKCCS Investigators 2000):
 - involved 2,226 cases and 2,226 controls in Stage 1 of study;
 - involved 3,800 cases and 3,800 controls in Stage 2 of study;
 - the conclusion of investigators from the UKCCS study, that “...found no evidence that magnetic fields associated with the electricity supply increase risk of childhood leukemia, malignant brain (or other central nervous system) tumours, or any other childhood cancer” (UKCCS Investigators 2000);
 - the problems associated with pooled (meta) analyses and how results are inconclusive;
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- three recent studies showing no association between electric blanket use and breast cancer;
- occupational epidemiology and how, in over 100 studies, no causal relationship between EMFs and cancer has been established; and
- how lab research studies suggest no causal link between cancer and EMF, even given the controlled nature of the experiments and the use of extremely high EMF exposures up to 50,000 mG (milligauss).

4.4.3 EMF Position Statements and Classification Systems

- the Federal-Provincial-Territorial Radiation Protection Committee (FPTRPC) Position Statement of 1998;
- the use of the International Agency for Research on Cancer (IARC) classification system to define a “weak association” between EMF and cancer; and
- the National Institute of Environmental Health Sciences (NIEHS 1999) statements and how consensus was required among opposing views.

4.4.4 Overall Interpretations of EMF Studies

- Sir Richard Doll’s conclusion that there is no causal link between EMF and cancer and no justification for conducting further epidemiological studies on EMF and childhood cancer in Britain (UKCCS Investigation, 2000); and
- Dr. Jack Mandel support of Doll’s position that there is no causal relationship between EMF and cancer.

4.5 INTERNATIONAL COMMISSION ON NON-IONIZING RADIATION PROTECTION (ICNIRP)

The Health and EMF Experts at the Workshop also considered the guidelines regarding exposure to EMFs as prepared by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). ICNIRP is an international and independent body comprised of specialists in the field of EMF research, whose function is to provide recommendations on “health-based”

guidance to limit exposures to EMF. Dr. Harry Johnson of CancerCare Manitoba provided an overhead presentation (ref. Appendix E) that, in summary, included a description of:

- the electro-magnetic (EM) spectrum and a description of the zone of ionizing and non-ionizing radiation, and that ELF is a force field, not radiation;
- the history of ICNIRP – including a description of the commission and the history of the International Radiation Protection Association, International Commission on Non-ionizing Radiation Protection (ICNIRP) and Non-Ionizing Radiation Working Group;
- the limits regarding health effects, the classes of guidelines, the frequencies covered by the guidelines, time-varying fields, safety factors, exposure limits and physiological responses to ELF; and
- the guideline that recommends a limit of 4.16 kV/m and 83.3 μ T (833 milligauss) for 24-hour exposure of the general public (ICNIRP 1998).

Dr. Johnson explained that following the publication of the ICNIRP (1998) guidelines, several institutions criticized the guidelines as lacking clear interpretation on exposure safety or direct application. Dr. Johnson believes that the ICNIRP guidelines are overly conservative. He does not advocate the acceptance of ICNIRP guidelines in Manitoba.

4.6 REVIEW OF EXPERIENCE: HOW JURISDICTIONS IN CANADA AND ELSEWHERE DEAL WITH EMF CONCERNS

The Workshop also considered how other Canadian jurisdictions deal with the EMF issue. Blair McMahon of TetrES Consultants Inc. provided an overhead presentation (ref. Appendix F) that, in summary, included a description of topics outlined below.

4.6.1 Phone Survey Results

The results from a phone survey involving 22 individuals contacted across Canada revealed the following:

- there are no Canadian ELF-EMF guidelines at present or in development;
 - there are no avoidance policies for siting transmission lines based on EMF;
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- agencies refer to existing guidelines, e.g., the Federal-Provincial-Territorial Radiation Protection Committee (FPTRPC) statements, ICNIRP and IEE (Institution of Electrical Engineers) draft guidelines; and
- that information on EMFs are disseminated and, where appropriate, monitoring occurs.

4.6.2 EMF Position Statements, Guidelines and Policies

There currently are no province-specific guidelines or legislation in Canada that identifies acceptable levels of EMFs emanating from transmission and distribution lines, i.e., extremely low frequency (ELF) electric and magnetic fields, typically 60 Hz in Canada. The provincial governing bodies in Canada currently do not have provincially established standard practices in responding to EMF-related concerns that are based on a definition of acceptable levels of EMFs. When dealing with EMF issues, most provincial authorities in Canada reference other federal and international guidelines, including the:

- Federal-Provincial-Territorial Radiation Protection Committee (FPTRPC) Position Statement of 1998 (ref. Appendix G). This Position Statement, which is currently under review, is developed on the basis of the following conclusion: “*The research taken overall indicates that the evidence is insufficient to conclude that electric or magnetic fields cause a risk of cancer*”;
- ICNIRP (International Commission on Non-Ionizing Radiation Protection) guidelines;
- IEE (Institution of Electrical Engineers) draft guidelines; and
- Health Canada guidelines (Safety Code 6), which does not set standards for EMFs below 3 kHz.

Some Canadian organizations, such as Ontario Hydro, have responded to concerns regarding EMFs by hosting community meetings to discuss the issue. B.C. Hydro adopted the approach of giving concerned citizens the metering devices needed to measure EMF fields.

The approach used by Manitoba public health and Manitoba Hydro representatives in responding to individuals having EMF concerns is consistent with the approach followed in other Canadian provinces and territories. When concerns regarding EMFs are directed to the provinces of Manitoba, Saskatchewan and Ontario (ref. Appendix F), provincial authorities first refer to the 1998 Position Statement developed by the FPTRPC. ICNIRP guidelines may be

referred to as an international standard on EMF exposure levels. If the information does not alleviate the concern, provincial representatives will on occasion send out a technician to take measurements to determine the level of EMF at a site.

4.7 GENERAL DISCUSSION

Discussions regarding electric and magnetic fields (EMFs) occurred following the presentations. A question and answer period occurred near the end of the Workshop. Relevant points of general discussions that occurred during the workshop are described in greater detail in Appendix H.

Discussions that occurred during the EMF Workshop focussed on the following topics:

- The results and conclusions from key EMF-related health studies, namely the National Cancer Institute (NCI) study and the United Kingdom (UK) study;
- the relationship between transmission lines and EMF exposure levels;
- the interpretation of international guidelines on EMF and their potential suitability for application in Manitoba; and
- how Canadian jurisdictions deal with EMF concerns.

4.7.1 Results and Conclusions of Key EMF Studies

Questions were raised regarding the confidence that Dr. Mandel and the scientific community in general have with regard to findings of some key EMF-related health studies, including the National Cancer Institute (NCI) study (Linnet *et al.* 1997; Kleinerman *et al.* 2000) and the United Kingdom study (UKCCS Investigators 2000). Dr. Mandel explained how these well-designed studies provide definitive evidence that supports the conclusions of Sir Richard Doll and other investigators that there is no demonstrable causal link between extremely low frequency (ELF) electric and magnetic fields (EMFs) and cancer (ref. Appendix H).

4.7.2 Transmission Lines and EMFs

Workshop participants asked questions regarding whether EMF exposure levels along transmission line rights-of-way comply with existing international guidelines and hydroelectric standards. John Chan of Manitoba Hydro explained that magnetic field exposure levels emanating from transmission lines in Manitoba are within the international guideline limits established by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). Manitoba Hydro adheres to occupational safety limits specified in the Canadian Standards Association (CSA) guidelines ensuring worker safety near electric fields (ref. Appendix H). Mr. Chan further indicated that presently there are no cost-effective ways of reducing EMF emission from transmission lines using different technical designs – such as through burying transmission lines.

4.7.3 Electric and Magnetic Field (EMF) Guidelines

Responding to questions regarding the interpretation of international guidelines on EMFs and whether they are suitable for application in Manitoba Dr. Johnson explained how the ICNIRP guidelines define an exposure limit at which a physiological response occurs. This does not necessarily mean that someone exposed to that level will develop a health-related problem such as cancer, because there has been no demonstrable causal relationship between EMFs and any adverse human health effects related to exposure. According to Dr. Johnson, the relationship that Manitoba and Canada should potentially have with ICNIRP, and whether to adopt the ICNIRP guidelines, is voluntary. Dr. Johnson suggested that the ICNIRP guidelines are overly conservative. He does not advocate the acceptance of ICNIRP guidelines for use as exposure limits for the public in Manitoba.

4.7.4 How Canadian Jurisdictions Deal With EMF Concerns

In response to the presentation on how jurisdictions across Canada and elsewhere deal with EMF concerns and how this relates to the Manitoba experience Dr. James Popplow of Manitoba Health indicated that he typically explains to individuals having an EMF-related concern the current thinking on EMF - that there is no causal relationship between EMF and

cancer. Manitoba Hydro typically responds to individuals having an EMF-related concern by providing them with an EMF pamphlet and, in some instances, by putting that individual in contact with Dr. James Popplow. The approach currently followed by Manitoba representatives in responding to individuals with EMF-related concerns is consistent with the approach followed by representatives from other Canadian provinces and territories.

5. CONSENSUS/RECOMMENDATIONS

Following extensive discussion at the EMF Workshop consensus was reached that a Position Statement (Consensus Statement) would be prepared by the Health and EMF Experts (the Experts) in attendance. In addition, a number of suggestions were put forward by the Workshop participants as appropriate recommendations to be considered by the Manitoba Clean Environment Commission.

5.1 APPROACH TO DEVELOPING THE POSITION STATEMENT

It was agreed that the FPTRPC Position Statement (1998) on EMF would be utilized as an initial guide towards developing an Expert's Consensus Statement flowing from the EMF Workshop discussions. It was generally agreed that wording in the statements would reflect the current understanding of the potential effects of EMF on human health. It was thought that the Consensus Statement that was formulated by the Health and EMF Experts could be considered for use as a guide for health care professionals in Manitoba.

Following extensive discussions the Consensus Statement outlined in Section 5.2 was developed. This statement builds on the FPTRPC statement (ref. Appendix G) and adds more definite wording where deemed acceptable by the Workshop Experts.

5.2 HEALTH AND EMF EXPERT'S CONSENSUS STATEMENT ON THE HUMAN HEALTH EFFECTS OF EXTREMELY LOW FREQUENCY ELECTRIC AND MAGNETIC FIELDS

1. The production of electric and magnetic fields (EMFs) is associated with the generation, transmission and use of electricity. People are exposed to these fields not only when they are near high voltage lines, but also at their places of work and in their homes. Such fields are produced by distribution lines, transformers, building and house wiring and by all devices that use electric power.
 2. Studies to investigate the potential health effects of these fields have been performed around the world for more than 30 years. Such research has included laboratory studies of
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cells, tissues and animals, as well as studies of human exposure in epidemiological studies.

3. The weight of scientific evidence does not support the conclusion that extremely low frequency EMFs such as those produced by power lines are a cause of adverse effects on human health.
4. Research to date¹ has not confirmed any biophysical mechanisms that would link properties of power and frequency fields to the initiation or promotion of cancer or any other adverse effect on human health.
5. Recommended exposure limits to prevent acute health effects at high levels of exposure have been put forward by members of the International Commission on Non-Ionizing Radiation Protection (ICNIRP)². ICNIRP has not determined that chronic exposures at lower exposure levels are adverse. As recommended by the European Commission, member jurisdictions are to implement these ICNIRP exposure limits on EMFs with the proviso that the ICNIRP recommendations apply “to relevant areas where members of the public spend significant time.”³ Currently available information on health and bioeffects of extremely low frequency fields does not provide a basis for establishing more restrictive exposure limits.
6. The Federal Provincial Territorial Radiation Protection Committee (FPTRPC) should continue to monitor the results of new studies, to re-assess their position in 2001 and in the future as new information becomes available, and to keep the Province of Manitoba apprised of their progress through the FPTRPC representative in Manitoba.

¹ Refer to Clean Environment Commission EMF Workshop Report (2001). Also to the Council of the American Physical Society – (85/04/22).

² ICNIRP Guidelines “Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz),” Health Physics, Vol. 74, No. 4, pp. 494-522, April 1998. The guidelines recommend a limit of 4.16 kV/m and 83.3 μ T (833 milligauss) for 24-hour exposure of the general public.

³ EU (European Union): COUNCIL RECOMMENDATION of 12 July 1999 On the Limitation of Exposure of the General Public to Electromagnetic Fields (0 Hz to 300 GHz) (1999/519/EC). Official J. Eur. Comm. L199:59-70(1999).

5.3 LINKS TO OTHER COMMITTEES/ORGANIZATIONS

Dr. Johnson advised that the Federal-Provincial-Territorial Radiation Protection Committee (FPTRPC) will meet in October 2001, and the larger committee might accept the work of the FPTRPC sub-committee examining ELF-EMF guidelines. As a member of the main body of the committee, he agreed to act as a link to the FPTRPC process on behalf of Manitoba.

Dr. Popplow indicated that he would advise members of the Federal-Provincial Committee for Occupational Health (FPCOH), for which he is a member, of the results of the CEC-sponsored Experts Workshop.

5.4 MANITOBA HYDRO'S EMF PUBLIC INFORMATION BROCHURES

In 1991 Manitoba Hydro produced pamphlets for the public on EMFs indicating that the literature on health-related effects of EMFs are inconclusive. John Chan advised that this literature was produced in response to the EMF issue as related to proposed development of Bipole III in the early-1990s (as a component of the sale of power from the previously proposed Conawapa Generating Station on the Nelson River to Ontario). Mr. Chan suggested that the EMF literature produced previously by Manitoba Hydro is dated and that he would take steps towards updating that information. Mr. Chan indicated that Hydro would update their EMF brochure.

5.5 QUESTION / ANSWER EMF DOCUMENT

There was consensus that information produced and provided by a public health agency would be perceived as more credible than that provided by an electrical utility. Dr. Popplow agreed to take the lead in developing a Question and Answer (Q & A) document regarding EMF for the general public. He suggested using a health protection Q/A document produced by Health Canada as a guide, with comments to be added to update the position. The National Institute of Environmental Health Sciences (NIEHS) Q/A document, as a component of the EMF Rapid Program in the U.S., could also be used as a background piece in formulating a Q/A document.

5.6 PRODUCTS AND SCHEDULES

Products from the Workshop would include:

- a Manitoba Health and EMF Experts Consensus Statement regarding Electric and Magnetic Fields to be prepared in draft form by the end of January, was targeted for mid-March 2001 for final production. This report summarizes key discussions relevant to the Consensus Statement developed by the Experts; and
- a Manitoba EMF Workshop Report that outlines in more detail the discussions of the Workshop, including the provision of presentation material in appendices. It was agreed that the target date for completion would be mid-March.

5.7 FOLLOW-UP

From late January through early-March 2001, drafts of the Health and EMF Experts Consensus Statement were provided to each of the experts in attendance at the EMF Workshop for review and comment. Consensus was reached between the Manitoba public health professionals and the EMF experts (that attended the Workshop) with respect to the wording of the EMF Consensus Statement prior to the writing of this report.

Following the EMF Workshop of January 25, 2001, EMF Experts received and reviewed recent reports (e.g., Havas 2000; O'Dell and Wasti 2000), National Radiation Protection Branch response statements and press releases that were not discussed at the workshop. After reviewing these documents, Dr. Mandel indicated that the conclusions and the Consensus Statement remain valid - that the weight of scientific evidence supports the conclusion that there is no demonstrable causal effect of extremely low frequency electric and magnetic fields, such as those produced by power lines, on any adverse human health-related outcome, including cancer.

6. CONCLUSIONS

After considering the state of the current research, as summarized by Dr. J. Mandel at the EMF Workshop of January 2001, the Health and EMF Experts felt that the weight of evidence is compelling. There is a definitive pattern of consistency and statistical strength in the findings of well-designed studies (epidemiologic and laboratory) over the past 30 years, particularly recently published studies (including the UK study directed by Sir Richard Doll) that support the conclusion that there is no demonstrable effect on human health from EMFs.

The Experts do not advocate the acceptance of the guidelines established by the International Commission on Non-Ionizing Radiation Protection for use as exposure limits for the public in Manitoba.

The Experts reached consensus on the need for a Consensus Statement to be developed on behalf of the Manitoba Clean Environment Commission (ref. Section 5.2). This Consensus Statement is primarily intended to assist public health officials in Manitoba in responding to concerns the public may express regarding EMFs.

In addition to the Consensus Statement respecting the human health related effects of exposure to EMF, the following suggestions were put forward as appropriate recommendations for action by the Manitoba Government:

- (1) That the Manitoba representative of the Federal-Provincial-Territorial Radiation Protection Committee (FPTRPC) submit the Consensus Statement on EMF to the FPTRPC for their consideration during review of the 1998-position statement.
 - (2) That Manitoba Hydro update its brochures and public information regarding EMF.
 - (3) That Manitoba Health develops a "reader-friendly" *Question and Answer* brochure regarding EMF and human health, to be used in general public distribution.
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7. REFERENCES

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Note: The above list of references includes literature cited in the main body of the report and the appendices. A list of contacts and personal communications associated with responses to the questionnaire and to other forms of communication is provided in Appendix B.
