



## CROSS-PARTY INQUIRY

into

# Childhood Leukaemia and Extremely Low Frequency Electric and Magnetic Fields (ELF EMF)

*REPORT*  
*JULY 2007*

Dr Howard Stoate MP (Chair)  
Michael Connarty MP  
Dr Ian Gibson MP  
Sandra Gidley MP  
Nick Hurd MP

# Contents

## Volume i: The Report

1. Foreword by Dr Howard Stoaite MP .....	5
2.1 Introduction .....	6
2.2 Background .....	7
2.3 Terms of Reference .....	8
3. Executive Summary .....	9
4. Recommendations .....	9
4.1 The Case for Precautionary Measures .....	10
4.2 Research Priorities .....	14
4.3 Public Information .....	16
4.4 Protection for Homebuyers .....	18
4.5 Energy Review: Wider Implications .....	19
4.6 Electricity Licensing: Corporate Responsibility .....	20
5. Implementing Precautionary Measures .....	21
5.1 Cost/Benefit Analysis .....	21
5.2 Paying for Precaution .....	23
5.3 Consents for Power Lines .....	24
5.4 National Planning Policy Statements .....	26
6. References .....	26

The appendices to this report are in a separate volume (Volume ii) available to download at the website of the Inquiry [www.epolitix.com/forum/cpielfemf](http://www.epolitix.com/forum/cpielfemf), or as a document or CD from the secretariat of the Inquiry: Catherine Nestor, Pall Mall Consult, 88 St James's Street, London SW1A 1PL, tel no: 020 7930 3581, email: [catherinen@pallmallconsult.com](mailto:catherinen@pallmallconsult.com)



## 1. Foreword by Dr Howard Stoate MP

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In 2006, I was asked if I would consider setting up what has become the Cross-Party Inquiry into Childhood Leukaemia and ELF EMF. The Inquiry considered whether precautionary measures are necessary to protect the health of children in relation to their risk of leukaemia. Current scientific thinking is that childhood leukaemia is likely to have more than one cause and there may be many factors in the development of the disease. One key finding of the Draper Report (Draper et al, BMJ, June 2005) was the association between children living within 200 metres of High Voltage Overhead Transmission Lines (HVOTL) and a 70% increased risk of leukaemia. Although this finding does not necessarily indicate a causal link, it certainly does suggest that there may be health risks associated with pylons that need investigating.

It seemed clear that as scientific knowledge on this issue was still emerging, policy decisions would need to be based on political, as well as scientific and economic considerations. With the need for affordable housing and the price and sustainability of energy topping the political agenda, the introduction of planning controls on HVOTL and house building is undoubtedly a thorny topic.

As a cross-party group, we have sought to put the subject into a broader public context, rather than one which concerns only scientists or the energy industry. As MPs, I feel an important part of our job is to devote time to consider issues such as electric and magnetic fields in greater detail, so that we can represent our own constituents and the wider public adequately on matters that may affect them.

This report is timely, coming after the First Interim Assessment of SAGE – the Stakeholder Advisory Group on ELF EMF - (published in April) and a new report from WHO (published in June). Both recommended the adoption of very low cost measures to reduce public EMF exposure. The SAGE recommendations have now been passed to the Health Protection Agency to consider and then advise Government.

I believe that the Cross-Party Inquiry Report adds significant weight to arguments for the adoption of solid precautionary measures, while recognising the complexities in taking this approach. I hope that our Report will not only help inform Government on EMF and health issues, but also encourage Government to put the precautionary principle at the centre of its decision making on EMF exposure and what measures should be taken to protect children's health.

I would like to thank the Members of the Inquiry: Michael Connarty MP, Dr Ian Gibson MP, Sandra Gidley MP and Nick Hurd MP for their dedication, enthusiasm and commitment, and on their behalf, thank CHILDREN with LEUKAEMIA for suggesting this Inquiry and for supporting the secretariat.

Signed



Dr Howard Stoate MP

## 2.1 Introduction to the Cross-Party Inquiry into Childhood Leukaemia and EMF

The Cross-Party Inquiry into Childhood Leukaemia and EMF was instigated by the charity CHILDREN with LEUKAEMIA, following the publication of new research funded by the Department of Health, the Draper Report (Draper et al, 2005), which demonstrated an association between residential proximity to High Voltage Overhead Transmission Lines (HVOTL) and risk of childhood leukaemia. The purpose of the Inquiry was to consider the case for taking precautionary action on exposure to Extremely Low Frequency Electric and Magnetic Fields (ELF EMF), the type of fields produced by HVOTL. The administration of the Inquiry was supported and funded by CHILDREN with LEUKAEMIA, although the Inquiry has been in no way subject to any conditions as a result of this link.

### Members of the Inquiry

The Chair of the Inquiry, Dr Howard Stoate MP (Labour, Dartford) invited Members with a strong interest in public health matters to join the Inquiry. Dr Stoate is a member of the Health Select Committee and a practising GP. Michael Connarty MP (Labour, Linlithgow & Falkirk East) has been active in the debate on EMF exposure and public health since 1981. Dr Ian Gibson MP (Labour, Norwich North) is Chair of the All Party Parliamentary Group on Cancer, and former Chair of the Select Committee on Science and Technology. Sandra Gidley MP (Liberal Democrat, Romsey) is a Liberal Democrat Party Spokesperson on Health and a member of the Health Select Committee. She is interested in a diverse range of health issues, from cancer to alcohol misuse. Nick Hurd MP (Conservative, Ruislip-Northwood) is a member of the Environmental Audit Committee.

### Secretariat

Catherine Nestor, Pall Mall Consult,  
88 St James's Street, London SW1A 1PL  
Tel no: 020 7930 3581  
Email: catherinen@pallmallconsult.com

### Website

[www.epolitix.com/forum/cpielfemf](http://www.epolitix.com/forum/cpielfemf)

### Contact

Correspondence should be addressed to the Chair of the Inquiry or to the Secretariat.

### Chair

Dr Howard Stoate MP, House of Commons,  
London SW1A 0AA  
Email: hstoate@hotmail.com

## 2.2 Background to EMF and Health Issues

The Cross-Party Inquiry into Childhood Leukaemia and EMF limited its work to examining the evidence for and issues surrounding the association between childhood leukaemia and Extremely Low Frequency (ELF) EMF - defined as the electric and magnetic fields with a frequency of between 30-300 Hertz (and more specifically the fields between 50-60 Hertz, such as those produced by power lines). The Inquiry did not consider any other health effects that have been linked with exposure to ELF EMF or health effects associated with other types of non-ionising radiation, such as RF (Radio Frequency) EMF from mobile telephone masts, etc. Hereafter the use of the term EMF refers to ELF EMF only.

### What are Electric and Magnetic Fields?

Both electric fields and magnetic fields are created by the generation and transmission of electricity. The term EMF is used to describe the mixture of these fields to which people are exposed. Major sources of EMF in our environment include High Voltage Overhead Transmission Lines (HVOTL – the lines which carry electricity from power stations to electricity substations), electricity substations (which ‘step down’ electricity voltage for use in homes), household wiring and electrical appliances around the home.

Most of the scientific research into the potential adverse health effects of EMF exposure has been concentrated on magnetic fields. Magnetic field strength is measured in tesla, or in microtesla ( $\mu\text{T}$  - 1 millionth of a tesla).

Laboratory studies have shown that exposure to EMF levels of around 100  $\mu\text{T}$  can cause damage to living cells, however a number of epidemiological studies (Greenland et al, 2000; Ahlbom et al, 2000; Draper et al, 2005) have reported an increased risk of leukaemia in children living close to power lines, leading some scientists to suggest that long-term EMF exposure at much lower levels (around 0.4  $\mu\text{T}$ ) can affect health.

Roughly 0.4% of homes in the UK (around 80,000 homes) have EMF readings of 0.4  $\mu\text{T}$  or above. About half of these ‘high field homes’ are caused by nearby overhead power lines; the rest are caused by household wiring and electrical appliances.

### What are the exposure limits?

In 2004, the Health Protection Agency (HPA) recommended that Government reduce public EMF exposure limits to 100  $\mu\text{T}$  (in line with guidance from the International Committee on Non-Ionising Radiation Protection - ICNIRP) and also consider the need for further ‘precautionary’ measures to reduce public exposure to EMF. The International Agency for Research on Cancer (IARC) also classified Extremely Low Frequency Magnetic Fields as a 2B carcinogen (defined as ‘possibly carcinogenic’, meaning that the biological evidence was characterised as ‘limited’).

With the HPA’s recommendation in mind, the Department of Health formalised the SAGE process. SAGE is the Stakeholder Advisory Group on Extremely Low Frequency Electric and Magnetic Fields, and includes



representatives from Government, the electricity industry, academia and campaign groups. The aim of SAGE was "to bring together the range of stakeholders to identify and explore the implications for a precautionary approach to EMF and to make practical recommendations [to Government] for precautionary measures."

The SAGE process has been funded equally by the Department of Health, National Grid and CHILDREN with LEUKAEMIA and produced its

'First Interim Assessment on Power Lines and Property, Wiring in Homes and Electrical Equipment in Homes' in April 2007. The Cross-Party Inquiry into Childhood Leukaemia and EMF has found the analysis and conclusions of the SAGE Report extremely useful in our deliberations. We feel that the work of the Inquiry complements that of SAGE, in adding a non partisan political assessment of the evidence and helping to identify the optimal solution to reduce exposure to EMF.

### 2.3 Terms of Reference

The Inquiry agreed the following terms of reference:

- To consider an overview of the scientific evidence linking EMF exposure with an increased risk of childhood leukaemia.
- To consider the legal framework related to human proximity to EMF and what the rights and responsibilities of the various stakeholders should be.
- To consider deliberative opinion research exploring public attitudes to precaution in this matter and a quantitative study examining the extent to which these attitudes are held generally.
- To encourage SAGE members to consider public opinion on the subject and how this should inform the actions of Government.

- To make recommendations regarding the appropriateness of precautionary measures to protect the public from EMF exposure and to communicate these widely to Government, parliamentarians, SAGE members and all relevant stakeholders.

The Inquiry fully understands that childhood leukaemia is not the only disease or condition that may be linked to EMF and that there are many possible causes of childhood leukaemia. However, it was felt that the topic of childhood leukaemia would not be examined fully in the Inquiry sessions if there were a broad range of diseases and conditions to consider in the time available. The aim has been for this process to contribute to any positive action the Government undertakes in the future to reduce exposure to EMF. This work would then be of benefit not only to children at risk of leukaemia but also to many other people whose health may be affected by EMF exposure.



### 3. Executive Summary

The Cross-Party Inquiry into Childhood Leukaemia and EMF was set up to allow the five Members (Dr Howard Stoate MP, Michael Connarty MP, Dr Ian Gibson MP, Sandra Gidley MP and Nick Hurd MP) to consider in detail the evidence for an association between Electric and Magnetic Fields (EMF) from High Voltage Overhead Transmission Lines (HVOTL) and an increased risk of childhood leukaemia and determine what should be done. The members of the Inquiry held 5 meetings during 2006 and 2007, taking oral and written evidence from a broad range of witnesses. Having examined the case for taking precautionary action on exposure to EMF, we make the following recommendations for Government to consider.

#### We recommend that Government:-

1. Recognise the potential risks to children's health caused by exposure to EMF and introduce a moratorium on the building of new homes and schools within at least 60 metres of existing High Voltage Overhead Transmission Lines (HVOTL) of 275 kV and 400 kV and on the building of new HVOTL within 60 metres of existing homes and schools and the same within 30 metres from 132 kV, 110 kV and 66 kV lines. The Inquiry also recommends that the Government consider the case for extending this distance to 200 metres for the highest voltage lines and pro-rata for lower voltages.
2. Channel increased funds into research into the association between childhood leukaemia and EMF, to elucidate possible biological mechanisms by increasing the budget of the Department of Health's Radiation Research Programme (managed by the Health Protection Agency).

3. Immediately implement SAGE's recommendation to provide more information to the public on the potential risks of EMF exposure, disseminate the SAGE report and the findings of the Cross-Party Inquiry widely in Parliament, enabling the relevant Select Committees (Health, Science and Technology and Trade and Industry) to decide whether to examine in detail Government policy on EMF exposure and public health. Communicate the findings and recommendations of SAGE and this Inquiry to devolved authorities in Scotland, Wales and Northern Ireland, to help inform debate and policy making across the UK.

4. Protect homeowners by allowing them access to information on either i) the proximity of a property (of 60 metres or less) to HVOTL or planned HVOTL or ii) EMF levels inside a property for sale and to implement the measures recommended by the SAGE Report to reduce EMF in the home from household wiring and appliances.

5. Consider the potential health risks of EMF exposure as part of the Government's Energy Review and give full consideration to alternative options, such as local generation, which could contribute to a reduced future need for new HVOTL.

6. Introduce new conditions on licences for electricity transmission and distribution, (granted by the Gas and Electricity Markets Authority, GEMA) requiring new and current licence holders to take steps to protect the public from possible adverse health effects caused by EMF exposure.



## 4.1 The Case for a Precautionary Building Moratorium

### Background

In 2004, the National Radiological Protection Board (NRPB, now the HPA-RPD) issued a Review of the Scientific Evidence for Limiting Exposure to Electromagnetic Fields (0 – 300Hz) and concluded that ‘the Government should consider the need for further precautionary measures in respect of exposure of people to EMF’. Although the Review describes the evidence for an association between adverse health effects and power lines as ‘weak’, it stated that ‘the least weak evidence is for the exposure of children to power frequency EMFs and childhood leukaemia’ and that ‘such studies, together with people’s concerns, provide a basis for considering the possible need for further precautionary measures in addition to the application of quantitative restrictions on EMF’.

The Inquiry examined both the scientific evidence linking EMF and childhood leukaemia and research on the level of public concern about electricity and health.

The Draper Report (Draper et al: BMJ, 2005) - the largest study to date on the association between HVOTL and childhood leukaemia – reported that children in England and Wales with a birth address within 200 metres of an HVOTL had an increased risk of leukaemia (a 69% increase in risk) compared with those living 600 metres or more away. Furthermore, the Draper Report found an increased risk of leukaemia (a 23% increase in risk) in children whose birth address fell within 200m – 600m of an HVOTL. The scientific evidence is examined in more detail in Section 4.2.

The Inquiry considered surveys included in the public opinion section of the SAGE First Interim Assessment, as well as quantitative and qualitative public opinion research commissioned by CHILDREN with LEUKAEMIA on the level of public concern regarding EMF and health. The qualitative research was conducted by Opinion Leader Research while the quantitative survey was carried out by TNS. The research was commissioned by the charity not only because public opinion may be a material planning consideration, but also because the views of the public will be a major consideration for the Government in forming a political judgement on this issue.

Liz Owen of Opinion Leader Research appeared before the Inquiry and highlighted the following findings from the two surveys:

- 3 out of 5 people surveyed were concerned about the effects of EMF on health.
- 3 out of 4 people surveyed thought that preventative action should be taken to protect children from EMF exposure.
- Burying power cables was the most popular option for limiting EMF exposure, followed by introducing a building moratorium.
- The public expressed a willingness to pay for precautionary measures (through increased electricity bills) such as burying power lines or introducing a building moratorium.
- Feedback from the deliberative research suggests that people want to have more input on the siting of new HVOTL through an improved notification procedure for people living and working close to proposed developments.

The evidence seen by the Inquiry suggests that members of the public are concerned about EMF exposure and public health, and that there exists public support for precautionary measures. In addition, the members of the Inquiry also note the recently published World Health Organisation (WHO) Environmental Health Criteria Monograph on Extremely Low Frequency Fields (No.328), which states that ‘provided that the health, social and economic benefits of electric power are not compromised, implementing very low-cost precautionary procedures to reduce exposure [to EMF] is reasonable and warranted.’

### Precautionary Measures

The Inquiry sought to understand in more detail the range of precautionary measures that could be implemented and their respective costs and implications. Evidence considered included the SAGE Report, testimony from representatives of National Grid and the Energy Networks Association and written evidence from the National Association of Estate Agents, The Royal Institute of Chartered Surveyors, as well as house builders Barratt Homes and George Wimpey UK Ltd.

The SAGE First Interim Assessment explores a range of options for reducing and/or eliminating exposure to EMF from the minimum intervention upwards. The options range from providing information to the public on the potential risks of EMF exposure, introducing a building moratorium on building within 60, 200 or 600 metres of HVOTL, up to undergrounding all high voltage power lines.

### Undergrounding

According to the Opinion Leader deliberative research, the public’s preferred option for action would be to bury power lines. National Grid told the Inquiry that they have estimated the cost of burying the 3000 kilometres of HVOTL closest to homes at £30 billion. They suggested it would take around 30 years to complete this process. The SAGE First Interim Assessment discounted the option of undergrounding lines as, although it would be the most effective way of reducing/eliminating exposure to EMF, the cost of the option was deemed to be prohibitive. The Inquiry has received further evidence which suggests that new technology already in use in other parts of Europe could lower the costs of undergrounding. The Inquiry notes that SAGE has identified possible changes in the cost of undergrounding as an area requiring further work in the future and feels that the conclusions of this work could usefully inform policy making in this area.

The TNS public opinion survey suggests that the average sum that members of the public are willing to pay extra on their electricity bills to fund precautionary measures is £3.66 per month, which would be sufficient to pay for undergrounding of the 3,000 km of HVOTL closest to homes over a 30 year period. The Inquiry recognises, however, that not all of those surveyed were equally willing to contribute to costs, nor would the costs be borne equally by all members of the public.



## Building Moratorium

According to Opinion Leader's deliberative research, the second most supported option for reducing exposure was a building moratorium, preventing new homes and schools being built within a certain distance of HVOTL and preventing new HVOTL being sited within the same distance of existing homes and schools.

According to readings taken by National Grid, EMF levels fall below 0.4  $\mu$ T at an average distance of 60 metres from 275 kV and 400 kV power lines and 30 metres for lines of 132 kV, 110 kV and 66 kV. However, the Draper Report notes an increased risk of leukaemia within 200 metres of HVOTL and a slightly increased risk as far as 600 metres away from HVOTL.

The SAGE First Interim Assessment identified a building moratorium (on the building of new homes and schools within a specified distance of existing power lines and the building of new power lines within the same distance of homes and schools) as 'the best-available option for obtaining significant exposure reduction'. The distances identified by SAGE were: 60 metres for 275 kV and 400 kV lines and 30 metres for 66, 110 and 132 kV lines. However, there was not a consensus among SAGE members as to whether this option could be an explicit recommendation to Government as some stakeholders felt that the costs of implementation outweighed the possible health benefits. SAGE estimates the costs associated with such a building moratorium at somewhere between £1-4 billion.

The Inquiry believes that a moratorium of 60 metres from 275 kV and 400 kV lines and 30 metres from 132 kV, 110 kV and 66 kV lines would be the minimum intervention to eliminate the majority of future EMF exposure of 0.4  $\mu$ T and above and effectively 'stop making the problem worse'. However, in light of the findings of the Draper Report, the Inquiry feels that a building moratorium at a distance of 200 metres from HVOTL should be given serious consideration by the Government, although we recognise that the cost of this option will be greater than for similar measures at 60 metres.

## Wider Implications of Precaution

The Inquiry recognises that the introduction of precautionary measures such as a building moratorium will necessarily have wider economic implications. In order to better understand these, the Inquiry sought evidence from the UK's biggest house builders, surveyors and estate agents.

These witnesses were asked to give evidence on the possible effects of a building moratorium on the housing market, how it would affect the saleability, mortgageability and value of existing homes and what compensation might be payable to these home owners for loss of value. Questions were also asked as to what effect a moratorium would have on the value of the UK housing market overall and how the public might react to such a measure.

Of particular help to the Inquiry were the responses received from the National Association of Estate Agents (NAEA), Barratt Homes and George Wimpey UK Ltd. The NAEA described some of their members finding it 'increasingly difficult' to sell houses which lie close to, or under, HVOTL – and stated that in some cases it is 'almost impossible to sell such houses'. Barratt Homes suggest that a discount of between 15% and 25% was needed to sell homes in close proximity to HVOTL, depending on the individual situation. They estimate that the further depressive effect – if a moratorium were introduced – would be an additional 15% - 20%.

George Wimpey, one of the UK's biggest house builders, told the Inquiry that they have an internal policy that restricts building within 200 metres of existing HVOTL. They described the reasoning for their policy as a combination of commercial factors and corporate social responsibility. They also remarked that a discount of 10% might be needed to sell homes close to HVOTL. The Inquiry notes that another possible [unintended] consequence of the imposition of a building moratorium could be developers choosing to underground lines in areas with the greatest development potential in order to prevent loss of value.

We also note that following the publication of the SAGE First Interim Assessment, the Royal Institution of Chartered Surveyors (RICS) called on the Government to legislate to restrict the building of new homes and schools next to existing power lines and on the placing of new power lines close to existing homes and schools.

## Implementation

There are a number of ways that the precautionary measures recommended by the Inquiry could be implemented within the existing legal and policy framework. These are discussed further in Section 5 of this Report.

## The 'Best Available' Option

From the evidence taken by the Inquiry, it is clear that exposure to EMF from HVOTL is associated with an increased risk of childhood leukaemia, that this has caused public concern and that the majority of the public would support action to protect children from EMF exposure. Having considered the cost and wider implications of various measures, the Inquiry feels that a building moratorium is the best available immediate option to reduce exposure.

## Recommendation 1

The Inquiry recommends that the Government recognise the potential risks to children's health caused by exposure to EMF and introduce a moratorium on the building of new homes and schools within at least 60 metres of existing high voltage overhead transmission lines (HVOTL) of 275 kV and 400 kV and on the building of new HVOTL within 60 metres of existing homes and schools and the same within 30 metres from 132 kV, 110 kV and 66 kV lines. The Inquiry also recommends that the Government consider the case for extending this distance to 200 metres for the highest voltage lines and pro rata for lower voltages.



## 4.2 Research Priorities

Despite a growing body of scientific evidence that suggests an association between childhood leukaemia and EMF exposure, no accepted consensus has emerged for a plausible biological mechanism to explain the association.

In ‘Do electric and magnetic fields cause childhood leukaemia? A review of the scientific evidence’ (Morgan and Martin, 2005), the authors examined the body of evidence relating to the relationship between EMF and childhood leukaemia. There are two different types of studies: epidemiological studies, which look at the distribution of childhood leukaemia cases and how this may be affected by EMF exposure; and laboratory studies which look for biological effects of EMF exposure.

Presenting to the Inquiry, review author Dr Adrienne Morgan, Staff Scientist at CHILDREN with LEUKAEMIA described the strength of epidemiological evidence linking the risk of childhood leukaemia to exposure to EMF as ‘good and reasonably consistent’ but stressed the importance of further rigorous epidemiological research to establish whether the association could be explained by ‘confounding factors’ (i.e. factors which may also affect the risk of leukaemia but whose effect cannot be separated out from EMF exposure).

The review also examined the body of evidence relating to the effects of EMF on DNA in biological systems, cell function and in animal models. The authors conclude that there is evidence both for and against a causal relationship between EMF exposure and damage in biological systems, but the results have so far been inconsistent and rarely reproducible.

Dr Morgan described to the Inquiry the difficulties and complexities in conducting and replicating research in this field of science, but did say that the fact that any evidence exists that demonstrates damage in biological systems represents ‘cause for concern’.

The Inquiry notes with interest that the recently published World Health Organisation (WHO) Monograph on ELF Fields also states that ‘resolving the conflict between epidemiological data (which show an association between ELF magnetic field exposure and an increased risk of childhood leukaemia) and experimental and mechanistic data (which do not support this association) is the highest research priority in this field’. The report recommends that epidemiologists and experimental scientists collaborate on this with new epidemiological studies focusing on new aspects of exposure, potential interaction with other factors or on high exposure groups. WHO also recommends that the existing pooled analyses be updated, by adding recent data and applying new insights.

The Inquiry believes strongly that further research is needed to identify the effects of EMF on biological systems. Collaborative research projects should be encouraged and funded to try to overcome some of the inconsistencies in previous research. Moreover, the Government should increase the levels of research funding in this important area.

The Inquiry sought evidence from the Health Protection Agency (HPA) on the scientific research that has been conducted in this field and their expert opinion on the further research needed to explain the association between childhood leukaemia and HVOTL and how the money could best be directed.

The HPA stated that [the science of EMF effects on health] ‘is a topic that continues to develop and remains an active area of research’. They also said that ‘HPA staff have a watching brief to monitor scientific developments and are also conducting relevant research.’

Dr Jill Meara of the HPA stated that epidemiological studies could be strengthened, possibly by pooling data on an international or global basis to help eliminate confounding factors. Dr Zenon Sienkiewicz of the HPA also said that further research was needed into the biological mechanisms behind leukaemia, in order to find out whether EMF does have a replicable biological effect.

The HPA manages the Department of Health’s Radiation Research Programme, which is the Government’s only budget that includes research into the effects of ionising and non-ionising radiation on health and risk perception of the effects of radiation. It is also the only government funding that includes research into the causes of childhood leukaemia. The health effects of ELF EMF have been identified as a ‘research priority’ for the Radiation Research Programme with roughly one quarter of their £1.1 million annual budget being spent researching the health effects of EMF. Whilst

commending this worthy programme, the Inquiry feels that this funding is insufficient and more money should be channelled into biological and epidemiological research on the health effects of EMF.

The Inquiry feels that the Radiation Research Programme is a suitable conduit through which to channel increased funding for EMF research and suggests that the Government increase the budget of the Department of Health’s Radiation Research Programme in order to allow more research to be conducted and also promote research into ‘possible biological mechanisms’ behind this association as a ‘research priority’ for the next round of grants. The Inquiry also suggests the Government investigate the possibility of ‘ring fencing’ a percentage of the Radiation Research Programme budget for EMF research.

### Recommendation 2

The Inquiry recommends that Government channel increased funds into research into the association between childhood leukaemia and EMF to elucidate possible biological mechanisms by increasing the budget of the Department of Health’s Radiation Research Programme (managed by the Health Protection Agency).



## 4.3 Public Information

It is clear from the public opinion research seen by the Inquiry, as well as the evidence submitted by local and national campaign groups and individuals affected by power lines, that the public is becoming increasingly concerned by the potential health risks of EMF exposure. As new scientific data is published, it becomes even more important for the public to have access to comprehensive and balanced information on possible health risks and what can be done to mitigate these risks.

One of the two explicit recommendations to Government contained in the SAGE First Interim Assessment is for Government to provide 'more information to the public on exposures'. The Assessment identifies the HPA as 'a suitable body' to compile and publish this information.

The Inquiry concurs with this recommendation and urges the Government to implement a full programme of public information on the association between childhood leukaemia risk and EMF exposure and advice on the measures that can be taken to minimise exposures.

### Information Sharing across Parliament

It is our hope that the issues identified in this report (and those raised by the

recommendations from the SAGE process) will encourage the Parliamentary Select Committees on Health, Science and Technology and Trade and Industry, to consider whether they wish to review present Government policy in this important area. We therefore recommend that the Government makes available to the relevant Select Committees both the SAGE First Interim Assessment and the Report of this Inquiry.

### Information Sharing with Devolved Authorities

Whilst the Inquiry recognises that planning is a devolved matter, we feel that the evidence discussed in this Report could be used to help inform policy decisions in Scotland, Wales and Northern Ireland. To this end we recommend that the Government holds talks with the respective devolved authorities to share information and discuss areas of mutual concern.

The Inquiry is aware of the work of the Cross Party Group on Electromagnetic Radiation and Health, established by Members of the Scottish Parliament last year to investigate possible health effects connected with electromagnetic radiation. The group held several meetings, assessing evidence linking EMF exposure to public health.

The Inquiry has also been informed of a high-profile campaign in Scotland concerning the proposed upgrade to 400 kV of the Beaulieu to Denny power line (a 137 mile route linking the Highlands to central Scotland). In August 2006 the Scottish Executive announced that plans to upgrade the Beaulieu-Denny power line, proposed by Scottish and Southern Energy, would be referred to public inquiry. Objections have been raised by councils, pressure groups and individuals on grounds of visual impact and public health. The public inquiry began in early 2007 and is due to conclude by the end of the year.

### Recommendation 3

We recommend that Government immediately implement SAGE's recommendation to provide more information to the public on the potential risks of EMF exposure; disseminate the SAGE report and the findings of the Cross-Party Inquiry widely in Parliament, enabling the relevant Select Committees (Health, Science and Technology and Trade and Industry) to decide whether to examine in detail Government policy on EMF exposure and public health; and communicate the findings and recommendations of SAGE and this Inquiry to devolved authorities in Scotland, Wales and Northern Ireland, to help inform debate and policy making across the UK.



## 4.4 Protection for Homebuyers

Currently in the UK, there is no requirement for those selling properties to measure EMF levels within a property or disclose the proximity of HVOTL and/or electricity substations to a property. Enhanced measures (i.e. greater disclosure) would enable homebuyers to make better informed decisions and protect themselves from high levels of EMF exposure. The Inquiry believes that information on the proximity of HVOTL to a property and/or EMF levels inside a property should be made available to potential buyers.

There are several ways in which this information could be gathered. The Inquiry notes that while it is relatively easy to measure the EMF levels in a location (a house for instance) by use of a handheld reader (although some training is required), readings may need to be taken over a 24 hour period and it would be difficult to obtain accurate readings of EMF from sources other than HVOTL (for example appliances or wiring) in houses that are for sale or are unoccupied.

The proximity of HVOTL to a given property is included in the Ordnance Survey Digital Mapping Database although the voltages (132 kV, 275 kV or 400 kV) of the lines are not specified. It would seem to be easier to map the proximity of properties to power lines, although this does mean that some 'high field homes' caused by EMF from household wiring or appliances may not be identified. Information on the siting of HVOTL is (in most cases) also held by Local Authorities.

Perhaps the simplest way of making this information available to potential homebuyers would be to include proximity to HVOTL as

part of a Local Search conducted by the Local Authority. This option would also involve issuing information to homebuyers about Local Searches to raise awareness of this resource.

Eventually, information relating to either i) existing or proposed power lines in close proximity to a property for sale or ii) the EMF levels inside a property for sale could potentially be included as part of the Home Buyer's Information Pack (HIPs). At present the HIPs will include a number of 'required' documents; in addition there are listed 'authorised' documents that could be made mandatory. These 'authorised' documents include searches for mining, flood risk, telecommunications and utility services etc. Information about EMF could be added in this category but would only be effective if these documents become mandatory. The Inquiry is aware, however, that this will involve higher costs for surveyors/estate agents as a result of equipment and training needs.

The Inquiry notes with interest that SAGE also recommends a programme of public information on EMF and for EMF readings to be taken as part of periodic inspections or building surveys when a property is being sold, alongside more detailed technical measures for reducing exposures from household wiring and appliances.

The SAGE recommendations for reducing EMF from household wiring are: a change to the IET 'On Site Guide' for electricians, recommending 'radial circuits' as standard (as opposed to 'ring-main' circuits), keeping 'go' and 'return' currents and meter tails together; revising BS7671 to require RCDs (Residual Current

Devices - also known as fuse boxes) for any new installation and the phasing out of rotating disc meters in favour of electronic meters. To reduce EMF exposure from electrical equipment in the home, SAGE recommends that equipment manufacturers should investigate whether fields from equipment could be reduced at low cost.

The Inquiry recognises that around half of all 'high field homes' are caused by appliances and household wiring and supports all of the measures that SAGE recommends to reduce or prevent these fields and urges the government to implement these measures.

## 4.5 Energy Review: Wider Implications

As scientific evidence on the possible health effects of EMF exposure develops, it is increasingly important for the Government to consider the wider public health implications of national energy policy. The Government's Energy Review is likely to pave the way for more varied energy supply; increased dependence on renewable energy sources, expanded nuclear capacity, exploration of alternatives such as local generation, etc. The increased infrastructure required (in the form of new HVOTL and electricity substations) could mean a rise in public exposure to EMF. The Inquiry believes that public health issues such as EMF exposure should be an important consideration, not only in formulating local planning policy, but also when considering changes in national energy policy.

### Recommendation 4

We recommend that the Government protect homeowners by allowing them access to information on either i) the proximity of a property (of 60 metres or less) to HVOTL or planned HVOTL or ii) EMF levels inside a property for sale and to implement the measures recommended by the SAGE Report to reduce EMF in the home from household wiring and appliances.

The Inquiry is also aware that certain policy initiatives in place in other countries, such as the encouragement of micro generation and small scale local generation of energy seen elsewhere in Europe, could reduce the need for increases in major infrastructure, particularly new HVOTL and urges the Government to give full consideration to potential health benefits, as well as the more obvious ecological benefits of such schemes.

### Recommendation 5

The Inquiry recommends that the Government consider the potential health risks of EMF exposure as part of the Government's Energy Review and fully consider other options, such as local generation, which could contribute to a reduced future need for new High Voltage Overhead Transmission Lines.



## 4.6 Electricity Licences: Corporate Responsibility

Under current legislation, licenses are required for the generation, transmission, distribution and supply of electricity. Power lines of 275 kV and 400 kV are defined as transmission lines, the main transmission licence holder in the UK being National Grid Plc, whereas 132 kV power lines are usually included in the distribution network, with distribution licences being held by regional power companies.

These licences are granted by the Gas and Electricity Markets Authority (GEMA). At present, the Authority is not required to consider public health when granting licences and standard licence conditions do not require current licence holders to consider public health in respect of EMF.

The Inquiry asked whether the Secretary of State for Business, Enterprise and Regulatory Reform could impose conditions requiring health and safety issues to be considered before granting transmission and distribution licences. Bircham Dyson Bell (Inquiry witnesses who prepared the report 'Electrical and magnetic fields and public health: Legal requirements, responsibilities and shortcomings') saw no reason in law why such conditions could not be imposed.

As very few new licences for electricity transmission and distribution are actually being granted, the Inquiry believes that conditions should be placed on new licences and current licences. Section 8 of the Electricity Act (1989) gives the Secretary of State power to revise the standard licence conditions for transmission and distribution licences, which current licence holders would have to uphold.

The Inquiry believes that electricity companies that transmit and distribute electricity should be required to take some precautionary measures to protect the public from exposure to EMF, such as optimally phasing existing power lines, undergrounding lower voltage lines where possible and not building new power lines within 60 metres of homes and schools.

Although GEMA also has the power to change standard licence conditions, the Inquiry recognises that, as the authority governing the Office of Gas and Electricity Markets (Ofgem), the regulating body responsible for keeping prices competitive, introducing new licence requirements that increase costs for electricity companies is more difficult for GEMA than for Government. The Inquiry therefore recommends that the Secretary of State for Business, Enterprise and Regulatory Reform take a clear policy lead on this issue, ensuring that GEMA/Ofgem can then make a recommendation to Government on how the costs should be borne.

### Recommendation 6

The Inquiry recommends that the Government introduce conditions on licences for electricity transmission and distribution, requiring prospective and current licence holders to take steps to protect the public from possible adverse health effects caused by EMF exposure.



## 5. Implementing Precautionary Measures

The Inquiry recognises that the first recommendation of this Report - the introduction of a building moratorium on new building near HVOTL - raises many difficult issues of costs and implementation. The Inquiry has considered in detail the changes needed to the existing legal and policy framework to implement a moratorium, as well

as the assessment process that will be carried out by the Government prior to the introduction of new policy. This section is devoted to the identification and discussion of these issues and includes suggestions from the Inquiry and further options for implementation.

### 5.1 Planning Guidelines: Cost/Benefit Analysis

The Inquiry recognises that the most likely policy mechanism used to implement a building moratorium would be for the Department of Communities and Local Government to issue a planning circular on HVOTL. Any new statutory instrument, such as a draft planning circular, requires a Regulatory Impact Assessment (RIA), and this would involve an analysis of the costs and benefits of a building moratorium. The SAGE First Interim Assessment on precautionary approaches to EMF attempted to do much of the work of a Regulatory Impact Assessment, with particular emphasis on cost-benefit analysis. The Inquiry notes that although the SAGE Report quantified many of the key costs and benefits, there are several areas which require more work, as discussed below.

#### Costs

The SAGE report estimated the costs of a building moratorium (of 60 metres) at between £2-4 billion, consisting of compensation to affected landowners for loss of development potential and devaluation of existing housing stock next to HVOTL. The devaluation of

existing housing stock close to existing HVOTL has been estimated by SAGE at somewhere between £0-2 billion. It is important to recognise, however, that these are the extremes of the possible cost and not a mid-range estimate (the difference must be identified as part of the cost-benefit analysis required for an RIA).

The SAGE cost-benefit calculations are based on the assumption that houses next to power lines are already discounted by 5% and that a building moratorium could depress prices by a further 5%, however, evidence collected by the Inquiry (gathered after the SAGE group conducted their cost-benefit work) suggests that much of this second discount has already occurred. According to George Wimpey UK Ltd, houses near power lines currently require a discount of around 10% to sell and Barratt Homes told the Inquiry that houses close to HVOTL are currently discounted by between 15-25%.

Barratt Homes speculated that the introduction of a building moratorium could see prices drop by a further 15-20%, although it could be



## 5.2 Planning Guidelines: Paying for Precaution

argued that clear planning policy, such as a building moratorium could have a stabilising effect on house prices in some areas. These estimates of loss of property value must also be weighed against the gains (or prevention of loss) of property value in other areas, where proposed power lines would now not be granted planning consent.

In the SAGE First Interim Assessment, the compensation costs owed to homeowners and landowners for loss of development potential was given a figure of around £2 billion, although this figure could be minimised by adopting a process currently in practice in Switzerland, where planning controls on HVOTL exclude all current planning applications. This option was considered briefly during the SAGE process, but was eventually listed in the First Interim Assessment as a subject for further consideration in the future. The Inquiry feels that this option should be considered by Government when assessing the costs of implementing a building moratorium.

### Benefits

Although the SAGE cost-benefit analysis quantified benefits such as the value of deaths prevented (Value of Prevented Fatalities – VPF) by reduced incidence of leukaemia and the value of Quality Adjusted Life Years (QALY) for those children prevented from developing leukaemia (non-fatal), some benefits were not quantified. These included the savings to the NHS for treatment of those not developing leukaemia (fatal or otherwise) and significantly, the public's willingness to pay for a particular 'good' – in this case the removal of health risk and improved visual amenity of preventing

HVOTL and homes and schools being built near each other. The Treasury Green Book recommends that attempts are made to quantify the public's willingness to pay as part of the cost-benefit analysis for a Regulatory Impact Assessment.

One survey the Inquiry is aware of on the public's willingness to pay is the TNS UK-wide quantitative survey on EMF and health, commissioned by CHILDREN with LEUKAEMIA, which included a question asking how much extra people were willing to pay on their electricity bills to see action taken to prevent children being exposed to EMF from HVOTL. The results showed that the average sum the public were willing to pay extra per month to fund precautionary measures was £3.66. Although the Inquiry recognises that a stated willingness to pay does not always translate into an actual willingness to contribute financially, and that not all of the people surveyed were willing to contribute, how public concern translates into an actual willingness to fund precautionary measures is an important part of any cost-benefit analysis and Government must make every attempt to quantify this.

We suggest that the Government fully analyses the costs and benefits associated with a building moratorium as part of a Regulatory Impact Assessment, focusing on issues such as: the potential effect on residential property prices; the possible savings to the NHS of reduced incidence of childhood leukaemia and other health effects which have been associated with EMF exposure; and how public concern about EMF translates into a willingness to pay for precautionary measures.

A further requirement of the Regulatory Impact Assessment for a new Planning Circular is that Government must assess who will pay the costs and who will receive the benefits of any given legislation (i.e. the consumer, industry, Government, etc). They must also identify any unintended consequences and indirect costs and the parties affected by these.

It is clear that there will be a cost associated with the introduction of precautionary measures to reduce or prevent EMF exposure from HVOTL (which will be analysed in the cost-benefit analysis) and the Inquiry feels that this cost should be borne fairly.

We recognise that issues such as winter fuel poverty are politically sensitive and cannot be ignored; however, evidence considered by the Inquiry (in the form of deliberative public opinion work conducted by Opinion Leader Research) suggests that the public feel that the financial responsibility to reduce or prevent EMF exposure should be shared between Government, the electricity industry and electricity consumers.

It is important to note that business users (factories, large companies, etc) are the major consumers of electricity in the country and therefore any rise in electricity unit prices would disproportionately affect business. Conversely, householders would receive the majority of the benefits of any legislation, so intuitively it would appear that householders should bear the majority of the cost. A cost per user rather than per unit would therefore seem fairer, although fuel poverty issues would therefore need to be considered very seriously.

The Government will also have to identify indirect costs, such as increases in costs for other goods and services arising from increased electricity prices and unintended consequences, such as the possibility that lower prices for houses near HVOTL could lead to an increase in the number of people from low-income brackets – including families with young children – living in these houses.

The Inquiry recognises that one of the major costs of a building moratorium would be the compensation payable by electricity companies to property/land owners for loss of value, and that these costs could have wider financial implications. The price of electricity in the UK is tightly regulated - price controls are conducted every five years for the transmission, distribution and generation networks.

From the evidence provided to the Inquiry by Ofgem, it is clear that the responsibility to decide how costs should be absorbed and whether the costs of any precautionary measures may be recovered by industry through increased electricity prices will fall to Ofgem as the industry regulator. Ofgem's first priority is to keep electricity prices for consumers competitive, although it does also have a responsibility to ensure that electricity companies are able to finance all of their activities, meet the standard conditions of electricity licences and comply with UK law.

The Inquiry feels that in this regard, Ofgem's responsibility to consumers should not be wholly about price. Issues such as sustainability and 'green' energy are becoming



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increasingly important, as evidenced by Ofgem's new annual Sustainability Reports and Green Energy Tariffs. The Government should allow and encourage Ofgem to act in the interests of the consumer, acknowledging that concerns over potential risks to public health, especially the possible risk to children, should be treated as of equal import as concerns over the environment and sustainability.

We suggest that as part of the Regulatory Impact Assessment for a new Planning Circular, the Government should investigate how the cost of precautionary measures would fall under the present regulatory framework and take such action as is necessary to ensure that additional costs are borne in proportion to benefit derived and ability to pay.

### 5.3 Consents for Power Lines

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The Inquiry also examined relevant legislation that could be amended to introduce a building moratorium. One possible legislative route for implementing precautionary measures would be changing the consenting procedures for overhead power lines.

The consent of the relevant Secretary of State is always required for the installation of new overhead power lines, regardless of voltage or length. Consent for lines of 132 kV and above is granted under Section 37 of the Electricity Act 1989. Significantly, although the Act requires the Secretary of State to consider issues affecting the health of the public, this does not apply to Section 37. The Inquiry feels that public health should be a consideration when deciding to grant consent for new power lines and suggests that the Electricity Act could be amended so that the requirement to consider public health applies equally to Section 37.

For new HVOTL of 275 kV and above (and some 132 kV lines), applicants (usually the electricity company) are required to conduct an

Environmental Impact Assessment (EIA) as part of the application process for Section 37 consent. They submit an Environmental Statement examining the 'significant effects on the environment' of the development, which should include an estimate of all emissions - including EMF levels. The applicant must show they have given consideration to alternatives to the proposed option (such as an underground cable) and the reasons why they have chosen the option. The EIA concerns the environmental impact of the development, and also includes factors such as visual amenity, locality and local disturbance. EIA regulations require consideration of the cumulative effects of the development (in conjunction with other factors/other developments in the area). EIAs could be amended to include a more explicit requirement to consider the potential effect on human health of a development (particularly those arising from pollution and other emissions, such as EMF).

The Inquiry feels that Environmental Impact Assessments should be mandatory for all new HVOTL of 132 kV and above. This would also

provide members of the public affected by the development with an opportunity to voice their concerns, as an EIA gives the Local Planning Authority (LPA) a designated period to raise an objection to the proposal and all documents are made public, allowing all interested parties to make representation to the relevant Secretary of State. If the LPA makes an objection, the Secretary of State can refer the matter to public inquiry.

For those currently living near to existing HVOTL, witnesses Sarah Wotton of Bircham Dyson Bell Solicitors and Brenda Short, lecturer in environmental law, stated that members of the public have only limited legal redress. From the evidence presented we suggest that the legal recourse available to the public in terms of existing HVOTL is unsatisfactory, and we would support any proposals the Government brought forward to strengthen the public's rights in this regard.

One possible route to strengthening legal redress would be through amendments to the legislation concerning General Permitted Development Rights. The Inquiry notes that although a consent procedure exists for all new HVOTL, modifications to existing power lines (and in some cases, upgrades to existing lines) are given General Permitted Development Rights (Town and Country Planning (General Permitted Development Order) 1995) in certain cases and do not require Section 37 consent or planning

permission. If the Government removed General Permitted Development Rights for overhead lines of 132 kV and above which lie within 60 metres of existing homes and schools (which the Secretary of State reserves the right to do under Article 4 of the General Permitted Development Order), electricity companies would then have to apply for Section 37 consent and conduct an EIA. This would encourage the consideration of alternatives, such as altered routes and undergrounding where suitable, bring existing HVOTL into line with new HVOTL whilst avoiding some of the costs associated with the 'compulsory purchase' option considered by the SAGE report, and create a forum for those members of the public affected by the lines to state their case.

The Inquiry suggests that in order to implement a building moratorium, the Government could amend the legislation on granting consent for overhead power lines to: include a requirement for the Secretary of State to consider public health in relation to EMF exposure; make Environmental Impact Assessments mandatory for all new HVOTL of 132 kV and above; extend the requirements of the EIA Environmental Statement to explicitly consider human health in relation to EMF; and remove General Permitted Development Rights for upgrades/modification to existing power lines of 132 kV or above within 60 metres of homes and schools, so that Section 37 consent is also required for these lines.



## 5.4 National Planning Policy Statements

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One of the new proposals outlined in the Government's White Paper: 'Planning for a Sustainable Future' is the introduction of National Policy Statements (NPS) for key sectors. These policy statements would apply for around 10-25 years and would be reviewed every 5 years – an additional benefit of this approach would be the flexibility allowed for policy to reflect emerging scientific evidence on EMF and health. An NPS would be given more weight in determining planning applications than any other statement, whether national, regional or local.

This new policy direction, combined with other moves to allow micro-generation for householders and to refer fewer planning decisions to the relevant Secretary of State, leads the Inquiry to suggest that this might be an alternative policy route through which to implement planning controls on HVOTL. A National Policy Statement on electricity could allow for the implementation of a building moratorium on power lines in close proximity to homes and schools. The Inquiry is aware, however, that the White Paper is in consultation and that this proposal may not be instituted.

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