

Organisation/company	Country	Table of contents	Please indicate the line numbers of the text on which you comment, if appropriate	Please upload your file (max. 1MB per file)	SCEER's Response
VEHS	Belgium	2.3 Health effects from ELF-EMF	Health effects of EMF I have are: Headache Tinnitus Depression <input type="checkbox"/> Since the introduction of 5G in the town where I live, the quality of the sleep is decreasing, resulting in tiredness during the day, less concentration abilities.		Thank you for your comment. Mobile communications frequencies (incl. 5G) are not within the scope of this Opinion.
Federal Office for Radiation Protection Germany	Germany	5.3.2 Neurodegenerative diseases	p. 22., l2: This chapter lacks essential articles, which should be included. This makes me again wonder about your search terms and search you performed. For example, you should have identified the systematic review by Rössli et al. from 2018 on "A meta-analysis on residential exposure to magnetic fields and the risk of amyotrophic lateral sclerosis", which also is a systematic review, because by definition a systematic search is needed to perform a meta-analysis, and therefore it should be mentioned here. p. 22, l.4: "our criteria" – This is not transparent at all. Please give information on how you identified your studies that you use for drawing conclusions.		Thank you the additional reference has now been included in section 5.3.2.1  The criteria for including the articles were added in the text. It should be noted here that although the literature search was for studies published after 2015 (SCENIHR Opinion), these meta-analyses and reviews included also single research studies which had been published before.
Federal Office for Radiation Protection Germany	Germany	5.3.1 Neoplastic diseases	Please find attached the comments to chapter 5.3.1 Neoplastic diseases with indicated line numbers of the text.	SCHEER_OpinionNF_2023_consultation_Comments_5.3.1_Baaken.docx	Thank you, additional references and discussion has been added.
VEHS	Belgium	2.3 Health effects from ELF-EMF	Since the introduction of 5G in our town, my hearing went down, with frequent tinnitus. Also there is brain fog and slight memory loss. Blood pressure increased suddenly above acceptable value.		Thank you for your comment. Mobile communications frequencies (incl. 5G) are not within the scope of this Opinion.
	USA	2 OPINION	Your opinion as to the health effects of EMF radiation is deeply flawed. It fails to consider the BioInitiative Report, the International Scientist Appeal on Electromagnetic Fields & Wireless Technology, the worldwide scientific evidence compiled by Dr. Joel Moskowitz of the Berkeley School of Health, the US National Toxicology Program Study, and all of the related analyses and meta-analyses. Please do your homework. Thanks. <input type="checkbox"/> <a href="https://bioinitiative.org/">https://bioinitiative.org/</a> <a href="https://www.saferemr.com/2019/07/international-scientist-appeal-on.html">https://www.saferemr.com/2019/07/international-scientist-appeal-on.html</a> <a href="https://www.sciencedirect.com/science/article/abs/pii/S0013935118304973">https://www.sciencedirect.com/science/article/abs/pii/S0013935118304973</a>		Thank you for your comment. The methodology taken for the Opinion is described in §4.1, which has now been amended for clarity and transparency.
German Federal Office for Radiation Protection	Germany	5.2.4 Cryptochrome – radical pair mechanism	Page 17, l.2 "regulation of circadian biorhythm" could be replaced by "regulation of circadian biorhythm and possibly magnetic compass sensing".		Thank you for the comment. The text has been amended.
German Federal Office for Radiation Protection	Germany	5.2.3 Effects on ion channels and calcium homeostasis	Page 16, l.36-l.44: The authors refer to one single (narrative) review paper (Panagopoulos et al [2021]), in which a mechanism is discussed whose effect on ion motion is an order of magnitude smaller than the root mean square displacement by thermal diffusion. It is unlikely that the discussed effect plays a major role in EMF-channel interaction. However, we agree with SCHEER's conclusion that further research is needed to substantiate the proposed hypothetical mechanism.		Thank you for the comment.
	United Kingdom	2 OPINION	Mandate: lines 30/31 There is no evidence that this report has focused on the "possible" effects of ELF and nor has it taken account of "relevant aspects of precaution" which are included in the mandate for SCHEER provided by Commission services.		Thank you for your comment. The methodology taken for the Opinion is described in §4.1, which has now been amended for clarity and transparency.
	United Kingdom	2 OPINION	line 14/15 "there is no convincing evidence for a causal relationship between ELF-MF exposure and self-reported symptoms". This conflicts with the SCHEER report on "Memorandum on weight of evidence and uncertainties" (2018) which does not use the term "convincing" strength of evidence as this would be too late for the precautionary actions which the EU recommends where there are "reasonable grounds of concern" (EU Communication on the Precautionary Principle, 2000). This is why the SCHEER Memo on WOE cited above recommends only "strong evidence" for its highest strength of evidence, followed by "moderate", then "weak" and then "uncertain". "Convincing" also begs the question: for whom is the evidence convincing? Risk takers or risk makers?		Thank you for the comment. The text has been amended to clarify that this is a citation from the previous SCENIHR Opinion (2015) and not the assessment of the SCHEER.
German Federal Office for Radiation Protection	Germany	5.2.8 Conclusions on interaction mechanisms	P19 L3: Since the radical pair mechanism is a theoretical concept rather than an outcome that can be measured (and meta-analyzed across studies), it is questionable that systematic reviews or meta-analyses can be conducted for this mechanism.		Thank you for this comment. The SCHEER believes that the results of these mechanisms can be studied and then systematically reviewed.

German Federal Office for Radiation Protection	Germany	5.2.6 Oxidative stress	It would be desirable if the SCHEER could include the information that measuring reactive oxygen species and oxidative damage is extremely challenging and has certain limitations. Therefore, not too much weight should be put on the individual results. Please note: A consensus statement that explains limitations and proposes best practice guidelines for assessing oxidative stress and damage has been published recently: Murphy, M.P., Bayir, H., Belousov, V. et al. Guidelines for measuring reactive oxygen species and oxidative damage in cells and in vivo. Nat Metab 4, 651–662 (2022). <a href="https://doi.org/10.1038/s42255-022-00591-z">https://doi.org/10.1038/s42255-022-00591-z</a>		Thank for the comment. The SCHEER is aware of the limitations in quantifying ROS and oxidative damage. No change in the text is required.
German Federal Office for Radiation Protection	Germany	5.2.4 Cryptochrome – radical pair mechanism	P17 L6: Since the radical pair mechanism is a theoretical concept rather than an outcome that can be measured (and meta-analyzed across studies), it is questionable that systematic reviews or meta-analyses can be conducted for this mechanism.		Thank you for this comment. The SCHEER believes that the results of these mechanisms can be studied and then systematically reviewed.
German Federal Office for Radiation Protection	Germany	5.2.3 Effects on ion channels and calcium homeostasis	P16 L26 It would be helpful to state effect directions and on how many studies (and what study quality) the listed findings are based on.		Thank you for the comment. The SCHEER cites here the results of the authors who performed the meta-analysis and evaluated all aspects of the individual studies. No change in the text is required.
German Federal Office for Radiation Protection		5.2.3 Effects on ion channels and calcium homeostasis	P15 L47: in order to avoid misconceptions please replace "substantiated" by "supported". □		Thank you for the comment. No change in the text is required.
German Federal Office for Radiation Protection	Germany	5.2.2 Melatonin hypothesis	P15 L 15: Here, it should be specified, that it is not clear by which biophysical mechanism ELF-EMF exposure could impact melatonin production. Therefore, this is not an interaction mechanism per se but at best only a small part of a putative causal chain.		Thank you for the comment. There are interaction mechanisms in this section describing the interaction with tissue/physiology at a macroscopic level. The SCHEER thinks it is not necessary to go into the technical details about how the interaction of ELF-EMF with living matter arises. No change in the text is required.
German Federal Office fo Radiation Protection	Germany	5.1.3 Exposure regulation	P14 L34: The words "of exposure" can be deleted because "level" refers to "internal fields".		Thank you for the comment. The text has been amended.
German Federal Office for Radiation Protection	Germany	5.1.2 Low frequency (LF) fields	P13 L39: This appears to be a little bit imprecise, because the sentence does not specify what exactly is meant by exposure (this problem applies in part throughout the document). I assume that very localized short-term maxima of the body external magnetic field levels are meant here. It might be helpful to distinguish between sources of very localized magnetic fields (such as hair dryers) and sources of more homogenous fields that cover the whole body (or even the whole flat) and explain that these are different exposure types (with implications for the efficiency of coupling into the body in terms of induced fields). P13 L41: Please add "lifelong" before "cumulative " to be consistent with the original publication. Further, it should be made clear that this exposure metric is used in epidemiology but there is no biophysical justification for it. P13 L42: you write: "one third of the total [lifelong cumulative] exposure experienced by an individual can be attributed to the use of personal appliances." Please note: The data that this statement is based on appears to be at least 20 years old and is strongly dominated by the contribution of motorized alarm clocks located close to the head (for 8 hours in bed). It is highly questionable that these numbers are still valid today (many people use their phones as alarm clock or use digital alarm clocks that emit much lower MF levels).		Thank you for your comment. The text clearly mentions the source before or after cititng a value from the respective literature.  Thank you for the comment. The term was added to reflect the original study, not the one cited in the Opinion.  Thank you for the comment. A note was added to the text.
German Federal Office for Radiation Protection	Germany	2.3 Health effects from ELF-EMF	P9 L6: A statement about accepted mechanisms such as electrostimulation by magnetic induction is missing P9 L8: Since the radical pair mechanism is a theoretical concept rather than an outcome that can be measured (and meta-analyzed across studies), it is questionable that systematic reviews or meta-analyses can be conducted for this mechanism.□ □ P9 L22-25: Is there a reason to distinguish between "weak WEIGHT of evidence" and "weak evidence" ?□ □ P9 L22-26: If there is indeed weak evidence for an interaction mechanism relevant for this specific endpoint it might be helpful to the reader if the mechanism that is meant here is specified.□		Thank you for this comment. The SCHEER believes that the results of these mechanisms can be studied and then systematically reviewed.  Thank you for the comment. The text has been amended.  Since the actual mechanism is not known, the SCHEER has adopted the weight of evidence for all interaction mechanisms that could be involved. No change in the text is required.
German Federal Office for Radiation Protection	Germany	2.1 Exposure	P9 L6: A statement about accepted mechanisms such as electrostimulation by magnetic induction is missing P9 L8: Since the radical pair mechanism is a theoretical concept rather than an outcome that can be measured (and meta-analyzed across studies), it is questionable that systematic reviews or meta-analyses can be conducted for this mechanism.		Thank you for the comments. Please, see the answers to your comments above.
German Federal Office for Radiation Protection	Germany	2 OPINION	Abstract: P2. I 36 It appears that an adjective such as "low" is missing before the word "weight"  P2. I 36 Please replace the words "become higher" by "reach higher levels".		Thank you for the comments. The text has been amended.

	Belgium	2.5 Environmental effects from LF-EMF	Dear, I can attest to effects on my health. On moving to an environment with lots of low and high-frequency rays, I could no longer sleep, I developed heart and immunity problems. Since I moved to a low-frequency area these effects have largely disappeared, for example my cholesterol went down by 20%.... There are also numerous studies confirming this. □		Thank you for your comment. Mobile communications frequencies (incl. 5G) are not within the scope of this Opinion.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	6 RECOMMENDATIONS FOR FUTURE WORK	p.29, line 21 ♦ As highlighted in the text, effects on marine ecosystems are possible and poorly documented. In the context of continuously increasing intensity and coverage of anthropogenic subsea ELF-EMF, a recommendation to do more research in this area would be welcome in this section.		Thank you for your comment. The text has been modified to make this clear.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	6 RECOMMENDATIONS FOR FUTURE WORK	p.29, line 25 ♦ Recommending more experimental research on childhood leukaemia and magnetic fields on the basis of a risk that appears to be decreasing more and more over time seems questionable. In the current state of knowledge, we can ask ourselves whether it is reasonable to hope finding a mechanism of action in an animal model. Expertise dedicated to childhood leukaemia including a solid assessment of the possible contribution of low frequency fields in this pathology, in mechanistic terms, and in terms of incidence taking into account exposure levels, the number of children exposed, etc. would be very useful for public health and decision-making, and also for future research in this area if needed.		Thank you for the comment. The text has been amended.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.5 Effects from low frequency fields on fauna and flora	p. 28 line 25 ♦ This clause describes mainly effects on fauna. There is nothing about flora which is mentioned in the title.		Thank you for the comment. The text has been amended.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.4 Health effects from IF fields	P.26 line 27 ♦ Bodewein et al. (2019) is missing in the bibliography listed p.30		Thank you for the comment. The reference has been added in the bibliography list.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.3.7 Other effects	p. 26 line 21 ♦ Tang et al (2022) is missing in the bibliography listed p.30		Thank you for the comment. The reference has been added in the bibliography list.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.3.7 Other effects	p.26 line 17 ♦ It should be mentioned : in rats exposed to ELF (50 Hz) between 50 and 500 μT		Thank you for the comment. The text has been amended.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.3.7 Other effects	p.26 line 16 ♦ Alkayyali et al (2021) is missing in the bibliography listed p.30		Thank you for the comment. The reference has been added in the bibliography list.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.3.3 Neurophysiological effects and cognition	p.24 line 24 ♦ The second experimental study observed disturbances of sleep following an intermittently applied 60 Hz, 28.3 μT exposure, but not with a continuous 28.3 μT exposure.		Thank you for the comment. The text has been amended.

SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.3.2 Neurodegenerative diseases	Huss et al (2018) is missing in the bibliography listed p.30		Thank you for the comment. The reference has been added in the bibliography list.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.3.2 Neurodegenerative diseases	Gunnarsson and Bodin (2017) is missing in the bibliography listed p.30		Thank you for the comment. The reference has been added in the bibliography list.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.3.2 Neurodegenerative diseases	p.22 line 5◆Killin and al. (2016) is missing in the bibliography listed p.30		Thank you for the comment. The reference has been added in the bibliography list.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.3.1 Neoplastic diseases	p. 20 line 7Two recent papers, Swanson 2019 and Amoon 2022 are not cited, that have reviewed epidemiological studies on childhood leukemia since the 1980s and since 2010 respectively. They have observed a decrease of the RR over the time. □ Swanson (2019) concluded that " there is a decline in reported risk from the mid 1990s to now, which is unlikely to be solely explained by improving study quality but may be due to chance, and an elevated risk remains. » (Changes over time in the reported risk for childhood leukaemia and magnetic fields. Swanson J, Kheifets L, Vergara X. J Radiol Prot. 2019 Jun;39(2):470-488. doi: 10.1088/1361-6498/ab0586. Epub 2019 Feb 8. PMID: 30736028.) □ Amoon (2022): This new pooled analysis concerns studies on childhood leukemia and magnetic field of the electricity transmission network published since 2010. The author concludes that "Our results are not in line with previous pooled analysis and show a decrease in effect to no association between MF and childhood leukemia. This could be due to methodological issues, random chance, or a true finding of disappearing effect." □ (Pooled analysis of recent studies of magnetic fields and childhood leukemia. Aryana T. Amoon, John Swanson, Corrado Magnani, Christoffer Johansen, Leeka Kheifets. Environmental Research, 2022. https://doi.org/10.1016/j.envres.2021.111993) □	Amoon_2022.pdf;Swanson_2019_J_Radiol_Prot._39_470.pdf	Thank you for the additional references. The text has been amended.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.3.1 Neoplastic diseases	p. 19 line 38◆Kheifets and al. (2017) is missing in the bibliography listed p.30		Thank you for the comment. The reference has been added in the bibliography list.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.3.1 Neoplastic diseases	p.19 line 36◆between RF-EMF exposure and childhood leukaemia . It should be corrected: between ELF-EMF exposure and childhood leukaemia		Thank you for this comment. The text has been amended.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.3.1 Neoplastic diseases	P.19 line 32◆Schuz and Erdman (2016) is missing in the bibliography listed p.30		Thank you for the comment. The reference has been added in the bibliography list.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.3.1 Neoplastic diseases	p.19 line 27◆The inclusion criteria are not defined in the document. See also comment on p.10 line 14.		Thank you for the comment. The text in §4.1 has been amended.

SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.2.4 Cryptochrome – radical pair mechanism	p.17 line 5♦(Ball 2016) is about breast cancer and does not mention childhood leukaemia		Thank you for the comment. The text has been amended.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.2.1 Tissue stimulation	p.14 line 28(ICNIRP 2014) is missing in the bibliography listed p. 30 International Commission on Non-Ionizing Radiation Protection (ICNIRP) (2014) ICNIRP Guidelines for Limiting Exposure to Electric Fields Induced by Movement of the Human Body in a Static Magnetic Field and by Time-Varying Magnetic Fields Below 1 Hz. Health Phys 106 (3): 418-425		Thank you for the comment. The reference has been added in the bibliography list.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.1.3 Exposure regulation	p.14 line 21Establishing limits without specifying the methods of comparison between the measured field strengths and the exposure limits leaves the door open to all interpretations, especially because the results can be very different. The 2015 Scenih report (Scenihr_o_41) already highlighted this point by noting that the root mean square (rms) value over 1 second was often used although not relevant. Some standards suggest that this is possible In fact, at least 5 methods are used depending on what is desired. Some of them also propose removing the start-up phases of electrical equipment where exposure can be maximum because the electrical current is greater than at steady state. To protect workers, Directive 2013/35/EU in its Annex II requires the use of the comparison method called weighted peak method in the time domain (WPM-TD) for LFs whether for reference levels or basic restrictions. Today, it would be appropriate to use the limit system of Directive 2013/35/EU by applying the public exposure limits taken from ICNIRP 2010 and also to retain the calculation method called weighted peak method in time domain (WPM-TD). The public would thus be better protected than by retaining the current limits and the rms calculation method. It must be recognized that the system put in place in the EMF Directive is technically complex, this is mainly due to the multidisciplinary nature of the subject (we note the work of remarkable quality that the Commission carried out between 2007 and 2013 to publish this Directive). Limits for static magnetic field should be also updated (see ICNIRP guidelines 2009).		Thank you for the comment. Although the SCHEER understands the point raised, risk management is outside of its scope and of the scope of this Opinion. No change in the text is required.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.1.3 Exposure regulation	p.14 line 21What is missing in this clause is the fact that ELF exposure limits for the workers are set in the 2013/35/EU directive and are based on the 2010 ICNIRP guidelines. □ This raised the question whether the exposure limits for the public should be revised to adopt the ICNIRP 2010. If not, a rationale would be useful to explain this choice on scientific basis or for other objective reasons.□		Thank you for the comment. Although the SCHEER understands the point raised, risk management is outside of its scope and of the scope of this Opinion. No change in the text is required.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.1.3 Exposure regulation	p.14 line 19This is not "a tendency", this is factual: there are differences in the reference levels between 1998 and 2010. Suggestion to replace the sentence by: "This led ICNIRP to raise the magnetic field reference levels in 2010 (for example, 100 µT to 200 µT for public exposure at 50 Hz). The electric field reference levels are, with some exceptions, basically unchanged. This does not mean that the limits are less conservative or less safe for magnetic fields exposure."		Thank you for the comment. The text was amended.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.1.3 Exposure regulation	p.14 line 11♦It should also be noted that there are changes in the physical quantities used (internal values): in the 1998 guidelines, the basic restrictions are expressed in induced current densities (mA/m <sup>2</sup> ) while in the 2010 guidelines the exposure limit values (ELVs) are expressed as induced electric fields (V/m).		Thank you for the comment. The text was amended.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.1.3 Exposure regulation	p.14 line 3♦There was no mandate from the European Commission to write standards from the 2013/35/EU directive. So there will be no harmonised standard for this directive.		Thank you for the comment. No change in the text is required.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.1.3 Exposure regulation	p.13 line 48The definition of harmonised standard is uncomplete. A harmonised standard is a European standard developed by a recognised European Standards Organisation (CEN, CENELEC or ETSI) at the request of the European Commission. A harmonised standard is recognised by the European Commission, by publication of its reference to the official journal of the European union, as giving presumption of conformity to essential requirements of EU regulation.		Thank you for the comment. The text was amended.

SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.1.1 Intermediate frequency (IF) fields	<p>p.13 line 17 It is not true to say that most of the interest for PLC is above 1.8 MHz in Europe. The situation depends on countries. Some European countries are using PLC in the band 3-148.5 kHz for measuring electric consumption. This has raised sometimes a lot of concern from the public, for the example the French Agency for Food, Environmental and Occupational Health Safety (ANSES), published several reports on public exposure to smart meters ("Exposition de la population aux champs électromagnétiques émis par les « compteurs communicants »).</p> <p>The conclusion of the report published in April 2023 (<a href="https://www.anses.fr/fr/system/files/AP2015SA0210Ra.pdf">https://www.anses.fr/fr/system/files/AP2015SA0210Ra.pdf</a>, the file is &gt; 1Mb and cannot be joined) is :« Thus, even if there is currently little data concerning the potential health effects linked to exposure to electromagnetic fields in the frequency bands relating to PLC (approximately 50 – 150 kHz), taking into account the very low levels of exposure measured as well as the conclusions of previous expert assessments (Afsset 2009, Anses 2013, Anses 2016): it is very unlikely that exposure to electromagnetic fields emitted, both by radio smart meters and by others (PLC), could cause short or long-term health effects. »</p> <p>[« Ainsi, même s'il n'existe à l'heure actuelle que peu de données concernant les effets sanitaires potentiels liés à l'exposition aux champs électromagnétiques dans les bandes de fréquences relatives au CPL (50 – 150 kHz environ), compte tenu des très faibles niveaux d'exposition mesurés ainsi que des conclusions des expertises précédentes (Afsset 2009, Anses 2013, Anses 2016) : il est très peu probable que l'exposition aux champs électromagnétiques émis, tant par les compteurs communicants radioélectriques que par les autres (CPL), puisse engendrer des effets sanitaires à court ou long terme. »]</p> <p>(<a href="https://www.anses.fr/fr/compteurs-linky-nouvelle-generation-faible-niveau-exposition-aux-ondes">https://www.anses.fr/fr/compteurs-linky-nouvelle-generation-faible-niveau-exposition-aux-ondes</a>)</p> <p>Therefore, exposure to PLC systems appears valid for the frequency range of EMF examined in the context of this opinion.</p>		Thank you for the comment. The text was amended.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.1.1 Intermediate frequency (IF) fields	<p>p.13 line 4♦All the data presented in this clause come from numerical simulation. It should be mentioned that measurements on real WPT system mounted on EV would be useful for validation of the dosimetry.</p>		Thank you for the comment. The text was amended.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.1.1 Intermediate frequency (IF) fields	<p>p.12, line 41♦Suggestion to clarify more precisely CFRP in the sentence, as follow: "...depended strongly on the material of the vehicle frame wich is made of iron, aluminum, 41 and carbon fibre reinforced plastic (CFRP)."</p>		Thank you for the comment. The text was amended for clarity.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.1.1 Intermediate frequency (IF) fields	<p>p.12 line 34♦There is a mistake in the abstract of (Kitajima 2013), compared to Table 1 of the paper. This line should be read "in the survey was 0.23 µT (standard deviation: 0.13 µT) at the ...</p>		Thank you for the comment. The text was amended.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	5.1.1 Intermediate frequency (IF) fields	<p>p.12 line 31♦As described by Aerts and al. (2017), certain electrical devices or systems consume more and more current or currents generating harmonic frequencies (or with very significant temporal variations) with the consequence of higher exposure (exposure increases with the current and with its frequency in LF). News electric equipment have appeared in Europe since this paper, with the same tendency. We can mention the inverter systems equipping, for example, the fast-charging systems of electric vehicles (150 kW or more). Providing exposure data with rigorous assessment method, for this type of equipment which will be more and more present in our daily lives, would be useful in this document.</p> <p>On the practical side, the measuring devices available today allow you to choose the appropriate limits and directly display the results according to the selected calculation method.</p>		Thank you for the comment. The text was amended.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	4.1 Data/Evidence	<p>p.10, line 14♦The way the literature discussed in this opinion was selected is not described.</p>		Thank you for the comment. The text has been amended.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	2.3 Health effects from ELF-EMF	<p>p.9, line 19-27♦This part should be reformulated in the light of all the recent meta-analyses published on the subject childhood leukemia and magnetic fields (see comments on section 5.3.1.1)</p>		Thank you for the comment. No change in the text is required.

SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	2 OPINION	abstract p.2, line 40 One letter is missing in "plants"		Thank you for the comment. The text was corrected.
SFRP section RNI (non-ionizing radiation section of the French Radioprotection Association)	France	2 OPINION	Abstract - p.2 line 26 : Clarify the meaning of ALS which has not yet been provided		Thank you for the comment. The text was amended.
French Agency for Food, Environmental and Occupational Health & Safety	France	2 OPINION	L'Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (Anses) a pris connaissance de l'avis du Scheer du 6 octobre 2023 concernant « les effets sanitaires potentiels de l'exposition aux champs électromagnétiques : mise à jour dans le domaine des fréquences entre 1 Hz et 100 kHz ». À l'issue d'une expertise collective consacrée aux effets sanitaires liés à l'exposition aux champs électromagnétiques basses fréquences, l'Anses a publié un rapport et un avis datés du 5 avril 2019. Dans cet avis, compte tenu des données de la littérature scientifique, l'Anses réitérait sa recommandation de limiter, par précaution, le nombre de personnes sensibles exposées autour des lignes à hautes tension ainsi que les expositions. À ce titre, elle recommandait de ne pas installer ou aménager de nouveaux établissements accueillant des personnes sensibles (hôpitaux, écoles...) à proximité immédiate des lignes à très haute tension, ni d'implanter de nouvelles lignes au-dessus de tels établissements. Par ailleurs, cette expertise a montré que certains professionnels peuvent être exposés à des niveaux de champs électromagnétiques très élevés, potentiellement supérieurs aux valeurs limites d'exposition (1 000 µT à 50 Hz), dans des situations particulières comme lors de l'utilisation de certaines machines industrielles. Ainsi, l'Anses rappelait l'importance de faire appliquer les dispositions réglementaires en matière de santé au travail et de réduire les situations de surexposition, en adaptant notamment les postes de travail. L'Agence attirait enfin l'attention sur les cas d'exposition de la femme enceinte au travail. En effet, il a été montré que dans certains scénarios d'exposition professionnelle, la densité de courant induite chez le fœtus peut être supérieure aux valeurs limites recommandées pour la population générale. L'Anses recommande donc de mieux informer et sensibiliser les femmes sur les dispositions réglementaires d'aménagement de leur poste de travail lorsqu'elles sont enceintes, afin de limiter l'exposition du fœtus aux champs électromagnétiques basses fréquences. Lien vers le rapport d'expertise et l'avis de l'Anses : <a href="https://www.anses.fr/fr/system/files/AP2013SA0038Ra.pdf">https://www.anses.fr/fr/system/files/AP2013SA0038Ra.pdf</a>	Anses_Opinion_LF_2019.pdf	Thank you for the comment. A summary of the ANSES report has been added to the text. However, risk management is outside of the scope of SCHEER; only research recommendations to fill knowledge gaps are included in the Opinion.
VEHS	Belgium	2.5 Environmental effects from LF-EMF	'I would like to add my comment to this public consultation, specific on Article 5.3.6, page 25, line numbers 40-42 and Article 2.3, p 9, line numbers 15-18. As an electrohypersensitive person the current standards are not sufficiently strict for me.' - 'In my house I have measured the intensity of EMF and it was ..... µT for the magnetic field and ... V/m for the electrical field. Although below the official limit, I strongly feel the effect on my health: I have .....(headache, pain in heart...) The safe limit for me is .....µT for the magnetic field and ... V/m for the electrical field in my experience.' - - 'The symptoms come with a delay and increase cumulatively with time.' - - 'At night, in order to be able to sleep, I always have to turn off the power in my bedroom and all the rooms around it.' - - 'My neighbor installed solar panels this year, and since that day I have much more headaches. I ordered a filter but am still waiting for it because apparently the filters on the market are not suitable for the harmonics caused by the inverters of the solar panels and this filter has to be made manually for me. This will cost me several thousands of Euros.' - - 'In one building I can do online computer work for several hours, in another I have to stop after an hour, and that with the same computer. Working on power from the battery instead of being connected to the electricity grid works better. There is even power on the internet cable, so I work offline as much as possible.'		Thank you for the comment. No change in the text is required.
Federal Office for Radiation Protection, Competence Centre for Electromagnetic Fields	Germany	5.5 Effects from low frequency fields on fauna and flora	The whole section 5.5 should not be based on one single publication (Pophof et al. 2023), which is a workshop report depending on the opinions of participants of a workshop selectively invited by the organizers. It does not fulfil even the criteria of a narrative review. Further sources which should be considered are: ECLIPSE Report (Malkemper et al. 2018, Vanbergen et al. 2019), Thielens 2021 (Environmental effects of 5G, STOA), Karipidis et al. 2023 (RF, systematic map), Mulot et al. 2023 (BAFU report on EMF effects on invertebrates, German). Additionally, Levitt et al. 2021 (EMF effects on flora and fauna Part 2) and Thill et al. 2023 (systematic review) are of relevance, but both suffer from methodological flaws. Malkemper, E.P., Tschulin, T., Vanbergen, A.J., Vian, A., Balian, E., Goudeseune, L., 2018. The impacts of artificial electromagnetic radiation on wildlife (flora and fauna). Current knowledge overview: A background document to the web conference. A Report of the EKLIPSE Project <a href="http://www.eclipse-mechanism.eu/">http://www.eclipse-mechanism.eu/</a> . Vanbergen AJ, Potts SG, Vian A, Malkemper EP, Young J, Tschulin T (2019) Risk to pollinators from anthropogenic electro-magnetic radiation (emr): Evidence and knowledge gaps. Sci Total Environ 695: 133833. 10.1016/j.scitotenv.2019.133833 STOA 2021: Environmental impacts of 5G. A literature review of effects of radio-frequency electromagnetic field exposure of non-human vertebrates, invertebrates and plants. <a href="https://www.europarl.europa.eu/RegData/etudes/STUD/2021/690021/EPRS_STU(2021)690021_EN.pdf">https://www.europarl.europa.eu/RegData/etudes/STUD/2021/690021/EPRS_STU(2021)690021_EN.pdf</a> Karipidis K, Brzozek C, Mate R, Bhatt CR, Loughran S, Wood AW (2023) What evidence exists on the impact of anthropogenic radiofrequency electromagnetic fields on animals and plants in the environment: A systematic map. Environmental Evidence 12(1). 10.1186/s13750-023-00304-3 Mulot M., Kroeber T., Gossner M., Fröhlich J. (2022) Wirkung von nichtionisierender Strahlung (NIS) auf Arthropoden, Bericht im Auftrag des Bundesamts für Umwelt (BAFU), Neuenburg, Juli 2022. <a href="https://www.bafu.admin.ch/bafu/de/home/themen/elektrosmog/fachinformationen/auswirkungen-elektrosmog.html">https://www.bafu.admin.ch/bafu/de/home/themen/elektrosmog/fachinformationen/auswirkungen-elektrosmog.html</a> Levitt BB, Lai HC, Manville AM (2022) Effects of non-ionizing electromagnetic fields on flora and fauna, part 2 impacts: How species interact with natural and man-made emf. Rev Environ Health 37(3): 327-406. 10.1515/reveh-2021-0050 Thill A, Cammaerts MC, Balmori A (2023) Biological effects of electromagnetic fields on insects: A systematic review and meta-analysis. Rev Environ Health. 10.1515/reveh-2023-0072		Thank you for your comments and the additional references. The text was amended.

Federal Office for Radiation Protection, Competence Centre for Electromagnetic Fields	Germany	5.4.5 Other	P. 27 I. 30-49: The information is very detailed - complete copy the left and right column of Fig. 2 from the paper by Lee et al 2022. This should be summarized. If you decide to keep this section in such a detail, then similar details from same figure for foetuses (middle column) should be included in section 5.4.2.1 (p. 26, line 48-50), this would go beyond the scope of the opinion.		Thank you for the comment. The text has been amended.
Federal Office ,Radiation Protection, Competence Centre for Electromagnetic Fields	Germany	5.3.2 Neurodegenerative diseases	P. 27 I. 13-14: Bodewein et al. (2019) reviewed two four studies describing contradictory effects on the brains of mice and rats, and an additional one investigating epileptic seizures.		Thank you for the comment. The text has been amended.
Federal Office for Radiation Protection, Competence Centre for Electromagnetic Fields	Germany	5.4.1 Neoplastic diseases	P. 26 I 33-38: With exception of the last sentence, this paragraph is not about neoplastic diseases, but a general description of the study by Lee et al. 2022.		Thank you for the comment. Although, the paper considers several endpoints, including carcinogenesis, the text has been amended.
Federal Office for Radiation Protection, Competence Centre for Electromagnetic Fields	Germany	5.3.7 Other effects	<p>P. 25 I 44: Bouché and McConway (2019) – this publication is already evaluated in section 5.2.2 Melatonin Hypothesis. We suggest harmonizing the text and mentioning this topic only on one position.</p> <p>P. 26 I. 8 "MF exposure duration most significantly caused changes in MLT". The sentence is difficult to understand. Should it be "Prolonged MF exposure....?"</p> <p>P. 26 I. 16: Alkayyali et al 2021: The citation is missing in References. Furthermore, it is not correct that this narrative review included only papers from Rajkovic et al. They identified 28 studies: 1 review, 6 human, 18 animal, 3 in vitro. Most, but not all are listed in Tab. 1 (hormones) and Tab 2 (histology). 4 Studies by Rajkovic are listed in Tab. 2, among others.</p> <p>Zang et al (2022) is missing in references. It is more about action mechanisms than about health and could possibly fit better to section 5.2.2</p>		<p>Thank you for the comment.No change in the text is required.</p> <p>Thank you for the comment. The text has been amended for clarity.</p> <p>The reference has been added. The text has been amended for clarity.</p> <p>The reference has been added. No changes in the text are required.</p>
Environmental Health Trust	USA	5.1 Exposure	<p>The exposure section as well as the recommended research section needs to include the exposures from various personal devices not just from laptops but also from virtual reality systems, glasses that have antennas, AC adapters, charging cords, video game consoles and earbuds to not just adults but also to infants and during various stages of pregnancy. Further situations such in schools, and train stations and in trains and transportation needs to be considered. There are numerous research gaps that need to be noted and addressed. People sleep surrounded by electronics. Larger electronics may be next to a sleeping space or under the bed.</p> <p>Examples:  Park et al., 2020's research investigating ELF-EMF levels in schools has found exposure at students' seat positions was mostly caused by electrical appliances, electronic wiring, and distribution boxes and the authors conclude that, "it is important to design safe and appropriate environments for digital learning in schools, such as proper seating arrangements, to avoid ELF-EMFs exposure to students as much as possible."  Makinistian, L., Zastko, L., Tvarožná, A., Dias, L. E., &amp; Belyaev, I. (2022). Static magnetic fields from earphones: Detailed measurements plus some open questions. Environmental Research, 214, 113907. <a href="https://doi.org/10.1016/j.envres.2022.113907">https://doi.org/10.1016/j.envres.2022.113907</a>  Abstract:Earphones (EP) are a worldwide, massively adopted product, assumed to be innocuous provided the recommendations on sound doses limits are followed. Nevertheless, sound is not the only physical stimulus that derives from EP use, since they include a built-in permanent magnet from which a static magnetic field (SMF) originates. We performed 2D maps of the SMF at several distances from 6 models of in-ear EP, showing that they produce an exposure that spans from ca. 20 mT on their surface down to tens of μT in the inner ear. The numerous reports of bioeffects elicited by SMF in that range of intensities (applied both acutely and chronically), together with the fact that there is no scientific consensus over the possible mechanisms of interaction with living tissues, suggest that caution could be recommendable. In addition, more research is warranted on the possible effects of the combination of SMF with extremely low frequency and radiofrequency fields, which has so far been scarcely studied. Overall, while several open questions about bioeffects of SMF remain to be addressed by the scientific community, we find sensible to suggest that the use of air-tube earphones is probably the more conservative, cautious choice.  Classification of the Extremely Low Frequency Magnetic Field Radiation Measurement from the Laptop Computers by Brodić D, Amelio A  "At the end, the measured magnetic field values are compared with the critical values suggested by different safety standards. It is shown that some of the laptop computers emit a very strong magnetic field. Hence, they must be used with extreme caution."  Bellieni CV, Pinto I, Bogi A, Zoppetti N, Andreuccetti D, Buonocore G. Exposure to electromagnetic fields from laptop use of "laptop" computers. Arch Environ Occup Health. 2012;67(1):31-6.  "When close to the body, the laptop induces currents that are within 34.2% to 49.8% ICNIRP recommendations, but not negligible, to the adult's body and to the fetus (in pregnant women). On the contrary, the power supply induces strong intracorporal electric current densities in the fetus and in the adult subject, which are respectively 182-263% and 71-483% higher than ICNIRP 98 basic restriction recommended to prevent adverse health effects. Laptop is paradoxically an improper site for the use of a LTC, which consequently should be renamed to not induce customers towards an improper use."</p>		Thank you for the comment. The section of exposure has tried to focus on emerging applications. Static magnetic fields are outside the scope of the Opinion. No changes in the text are required.



Environmental Health Trust	USA	2.3 Health effects from ELF-EMF	<p>The section 2.3 Health effects from ELF-EMF need to be updated in regards to the verbage on childhood leukaemia which does not reflect the substantial body of evidence. This sentence should at a mnimum be added "Epidemiological studies have consistently reported an association between childhood leukaemia and 50–60 Hz magnetic fields from power lines "</p> <p>As detailed in earlier comments by EHT the study by Seomun G, Lee J, Park J. in Exposure to extremely low-frequency magnetic fields and childhood cancer: A systematic review and meta-analysis. concluded "Significant associations were observed between exposure to ELF-MFs and childhood leukemia. Furthermore, a possible dose-response effect was also observed."</p> <p>"We checked for the presence of publication bias through a funnel plot and found that there was no evidence of publication bias (Fig 2). With the results shown in the meta-analysis that indicate the risk of childhood leukemia by the exposure level of ELF-MFs, the odds level increased as the exposure level increased (1.26!1.22!1.72), which shows a dose-response effect. This confirms an association between exposure to ELF-MFs and a high risk of childhood leukemia."</p> <p>Brabant C, Geerinck A, Beaudart C, Tirelli E, Geuzaine C, Bruyère O. Exposure to magnetic fields and childhood leukemia: a systematic review and meta-analysis of case-control and cohort studies. Rev Environ Health. 2022 concludes "Our results suggest that ELF-MF higher than 0.4 µT can increase the risk of developing leukemia in children, probably acute lymphoblastic leukemia. Prolonged exposure to electric appliances that generate magnetic fields higher than 0.4 µT like electric blankets is associated with a greater risk of childhood leukemia."</p> <p>Further, the section on 2.5 Environmental effects from LF-EMF also needs significantly more details regarding study outcomes as noted in earlier comments on the section on environmental effects.</p> <p>Levitt BB, Lai HC and Manville AM II (2022) Low-level EMF effects on wildlife and plants: What research tells us about an ecosystem approach. Front. Public Health 10:1000840. doi: 10.3389/fpubh.2022.1000840</p> <p>"Contrary to popular opinion, we know a great deal about how non-ionizing electromagnetic fields (EMF) affect non-human species because we have been using animal and plant models in research going back at least to the 1930's (1). Such research may have been conducted with humans in mind but can also be extrapolated to non-human species protection if we choose to apply it that way. Mice and rats have been the primary animal species used in research, but also rabbits, dogs, cats, chickens, pigs, non-human primates, amphibians, insects, nematodes, various microbes, yeast cells, plants, and others. Effects have been seen in all taxa, in various frequencies, intensities, and exposure parameters. To non-human species, these are highly biologically active exposures, often functioning as stressors..." "As noted in Panagopoulos et al. (54), natural and manmade EMF are significantly and fundamentally different. Unlike natural EMF, all anthropogenic EMF is polarized, meaning it is more biologically active via the ability to amplify intensities (called constructive interference) as well as alter cellular charged/polar molecule oscillations into parallel planes in phase with the applied field. This can result in irregular gating in cell membrane ion channels and thereby disrupt the normal cellular electrochemical balance. In other words, manmade EMF can capture, entrain, and manipulate living cells' basic functioning architecture unlike natural EMF with which most living things have evolved."</p>		Thank you for these additional references. The text was amended.
Environmental Health Trust	USA	5.3 Health effects from ELF fields	<p>There needs to be a section on Epigenetic effects with reference to these studies</p> <p>Giorgi G, Del Re B. Epigenetic dysregulation in various types of cells exposed to extremely low-frequency magnetic fields. Cell Tissue Res. 2021 Oct;386(1)</p> <p>"Epigenetic mechanisms regulate gene expression, without changing the DNA sequence, and establish cell-type-specific temporal and spatial expression patterns. Alterations of epigenetic marks have been observed in several pathological conditions, including cancer and neurological disorders. Emerging evidence indicates that a variety of environmental factors may cause epigenetic alterations and eventually influence disease risks. Humans are increasingly exposed to extremely low-frequency magnetic fields (ELF-MFs), which in 2002 were classified as possible carcinogens by the International Agency for Research on Cancer. This review summarizes the current knowledge of the link between the exposure to ELF-MFs and epigenetic alterations in various cell types. In spite of the limited number of publications, available evidence indicates that ELF-MF exposure can be associated with epigenetic changes, including DNA methylation, modifications of histones and microRNA expression. Further research is needed to investigate the molecular mechanisms underlying the observed phenomena."</p> <p>Manser M, Sater MR, Schmid CD, Noreen F, Murbach M, Kuster N, Schuermann D, Schär P. ELF-MF exposure affects the robustness of epigenetic programming during granulopoiesis. Sci Rep. 2017 Mar 7;7:43345.</p> <p>However, ELF-MF exposure showed consistent effects on the reproducibility of these histone and DNA modification profiles (replicate variability), which appear to be of a stochastic nature but show preferences for the genomic context. The data indicate that ELF-MF exposure stabilizes active chromatin, particularly during the transition from a repressive to an active state during cell differentiation.</p>	Epigenetic_dysregulation_in_various_types_of_cells_exposed_to_extremely_low-frequency_magnetic_fields.pdf	Thank you for the comment. Epigenetic effects are considered in the section of interaction mechanisms. No change in the text is required.

Environmental Health Trust	USA	6 RECOMMENDATIONS FOR FUTURE WORK	<p>ANSES 2019 Recommendations should be included</p> <p>Childhood leukaemia</p> <p>CES recommends: giving priority to pooled analyses, particularly for studies based on direct measurements of magnetic fields; encouraging epidemiological research into the effects of exposure to low-frequency electromagnetic fields taking account of possible co-exposure (such as pollutants from road traffic );</p> <p>"the CES recommends: encouraging the use of animal models to study acute lymphoblastic leukaemia, primarily by developing murine models of childhood leukaemia that can be used in studies ;</p> <p>Meningiomas Considering the heterogeneous results concerning a link between exposure to low-frequency electromagnetic fields and the occurrence of meningiomas, the CES recommends continuing epidemiological studies, particularly in workers.</p> <p>Ocular melanoma ... the CES recommends conducting an international study and/or a pooled study to confirm or refute this result.</p> <p>Amyotrophic lateral sclerosis (ALS) Considering: the identification by a small number of epidemiological studies of an association between ALS and exposure to low-frequency electromagnetic fields in workers: the lack of data on the chronic exposure of workers to low-frequency electromagnetic fields; the identification of a number of biological effects (oxidative stress) at exposure levels of around one millitesla, possibly found in some workers; that these biological effects mainly concern oxidative stress and that an existing ALS murine model involves an enzyme for oxidative balance (superoxide dismutase mutation); the CES recommends: giving priority to continued research into ALS, primarily with murine models specific to this disease; pursuing systematic and continuous registration of cases of ALS in order to encourage research through a population register placing the emphasis on occupational history. This would be similar to the Irish registry of motor neurone diseases, including ALS, as well as primitive lateral sclerosis and Kennedy's disease; continuing epidemiological studies in the workplace; assessing the relative proportion of risk for workers arising from either exposure to low-frequency electromagnetic fields or from the electric shocks that they may potentially have suffered. "</p> <p>"Considering: the non-homogeneous results concerning the appearance of Alzheimer's disease; the association observed in two studies between occupational exposure to low frequencies and the appearance of dementia; that this association was more significant in workers who had suffered electric shocks; that certain cognitive disorders were highlighted in animals exposed to low-frequency electromagnetic fields; the CES recommends: studying types of dementia other than Alzheimer's disease (frontotemporal dementia, Lewy body dementia, vascular dementia, etc.); assessing the relative proportion of risk for workers arising from either exposure to low-frequency electromagnetic fields or from the electric shocks that they may potentially have suffered."</p> <p>"Study of brain function Considering a number of studies that have highlighted: alterations in memory capacity as well as in levels of anxiety and emotion in animals, following exposure to low-frequency fields; alterations in brain plasticity and neurogenesis following exposure to low-frequency fields; disruptions in event-related potentials (EEG signals of very low intensity) in response to exposure to low-frequency fields in humans or animals; the CES recommends: continuing research in these fields in order to confirm or refute these results; finding out more about the biological mechanisms potentially involved; assessing the possible pathological consequences of these effects on children and adults."</p>	ANSES_Health_effects_associated_with_exposure_to_low-frequency_electromagnetic_fields_.pdf	Thank you for the comment. The majority of these recommendations for further research are already in the Opinion. No change in the text is required.
Environmental Health Trust	USA	5.1.3 Exposure regulation	<p>Additional content on the expert recommendations should be referenced in the section on regulation. Germany: Federal Office for Radiation Protection Website Info on ELF EMF magnetic Fields recommends precaution. "In addition to the established health effects, there are scientific indications for health risks at low field strengths. In order to take these indications into account, the Federal Office for Radiation Protection (BfS) recommends precautionary measures. Minimising public exposure can be achieved by various measures, the responsibility for which rests with authorities as well as building contractors or owners, appliance manufacturers and also with every citizen. The low-frequency fields the population is exposed to, should be as low as possible.</p> <p>The population should be informed about the known and suspected effects of the fields and about the field intensities of the relevant field sources such as high-voltage lines or electrical appliances. Research is ongoing to clarify these scientific issues."</p> <p>"Ways to reduce exposure Minimizing public exposure can be achieved by various measures, the responsibility for which rests with authorities as well as building contractors or owners, appliance manufacturers and also with every citizen:</p> <p>When planning and permitting buildings, safe clearance distances should be ensured from high-voltage lines and other power supply installations. Optimised electrical installation wiring can reduce the exposure of building occupants. This includes proper insulation and flush mounting of the electrical installations.</p> <p>Appliance and plant manufacturers can achieve lowest possible field strengths in the vicinity of equipment and plants by means of appropriate technical design. Suitable labelling on the equipment would also be desirable to enable the consumers to look out for low field intensities when buying appliances.</p> <p>All citizens can reduce their field exposure by following simple rules:</p> <p>by keeping the distance to field sources as large as possible, by keeping the duration of the exposure as short as possible and by turning off electrical appliances completely after use and not leaving them in standby mode. This applies especially to television sets and stereo systems.</p> <p>Sufficient distance from field sources should also be kept at night As nocturnal exposures are of a longer duration, particular attention should be paid to keeping sufficient distance from field sources for precautionary reasons. This applies, above all, to babies and toddlers. Mains powered clock radios should therefore not be placed right next to the headboard of a bed. Sufficient distance between the baby monitor transmitter - the power supply unit in particular- and the child's crib should be ensured. If possible, the transmitter should be operated with rechargeable batteries, as low-frequency alternating fields do not occur in that case."</p> <p>Finland Radiation Safety authority (STUK) recommends avoiding the construction of homes, day care facilities and schools where the magnetic flux density continuously exceeds the level of approximately 0.4 microtesla.</p> <p>Slovenia Precautionary limit (lower than ICNIRP) for ELF- EMF</p> <p>Level I protection (10 micro Tesla) shall apply to areas that require greater protection from EMF on the basis of precaution (e.g. around hospitals, residential areas, schools, kindergartens, playgrounds)</p> <p>Denmark Utilities measure magnetic fields at new installations: The annual average is not supposed to exceed 0.4 microteslas. no kindergartens or new buildings in the vicinity of a high-voltage line. . Danish Health Authority recommends against powerlines in vicinity of new homes and institutions where children stay.</p>		Thank you for the comment. It is not in the scope of the SCHEER or this Opinion to suggest exposure mitigation measures or any other risk management tools. The heading has been changed for clarity.

Environmental Health Trust	USA	5.1.3 Exposure regulation	<p>ICNIRP recommends a residential magnetic field exposure limit which allows levels well in excess of the level associated with childhood leukemia. This should be noted in this section along with a robust discussion of how numerous countries have policies to mitigate EMF exposure far below ICNIRP limits. Over a dozen countries (including France, Israel, and Germany) already have some level of protective policy to minimize residential ELF-EMF from high voltage transmission lines in place for "sensitive areas" regarding residential magnetic fields due to the consistent associations between residential exposure and childhood leukemia. Sensitive areas are generally defined as areas where children live and play such as schools, kindergartens or recreation areas. Sometimes the definition includes hospitals and residential areas. Several countries recommend residential exposures stay below 4 milligauss. Netherlands government has recommended local and provincial authorities and electric power transport companies apply a precautionary policy to minimize long-term exposure of children to magnetic fields from high-voltage transmission powerlines and in 2013, the government bought out houses which they determined could not be used as dwellings due to their location under powerlines. In 2018, a Report of the Electromagnetic Fields Committee of the Health Council found "indications for a causal relationship" between magnetic fields generated by overhead power lines and the incidence of childhood leukaemia and brain tumors.</p> <p>In France, the government recommends a "zone of caution" for new buildings with sensitive uses (e.g., hospitals, primary schools, kindergartens) near high-voltage infrastructure. Since 2012, the electricity transmission system operator mandates independent EMF measurements in the vicinity of power lines above 50 kV, and the results are publicly shared by the French health agency ANSES. In 2002, the Israeli Ministry of the Environment set an environmental guideline for magnetic fields in areas of new construction at 10 mG, and in 2013, the Ministers of Environment and Health set a maximum permissible level of exposure to ELF in places of prolonged chronic exposure, such as schools and residences, at 4 mG for those under 15 years old. In Israel, the Ministry of Environmental Protection recommended mitigating EMF in infant incubators.</p> <p>In Belgium -In Flanders, new power lines over schools and childcare centres should be avoided and passing over homes kept to a minimum. New schools and childcare centres should not be more than year-averaged exposure greater than 4 milligauss. In Brussels, a ministerial instruction requires that the magnetic field levels in places near newly installed transformers where children under 15 may stay is kept below a 24-hour average of 4 milligauss. Wallonia applies the limits in the EU recommendation to transformers. See Comparison of international policies on electromagnetic field (power frequency and radiofrequency fields) National Institute for Public Health and the Environment, RIVM 2017 Decree of the Italian Environment Minister on reducing EMF.</p> <p>Section 2.3.5.4 of the Decree recommends reducing exposure to indoor electromagnetic pollution</p> <p>Reduce low frequency magnetic fields: "In order to reduce as far as possible the indoor exposure to low frequency magnetic fields (ELFs) induced by electrical panels, uprights, conductor dorsals, etc." the design of the plants must provide that meters and electric panels are outside the building and take measures to reduce levels.</p> <p>Lithuania : Magnetic field limit in flats: 0.5 kilovolts per metre (kV/m) and 10 microteslas (µT) that is, 10% of the EU Council Recs</p>	Comparison_of_international_policies_on_electromagnetic_fields_2018.pdf	Thank you for the comment. However, this paragraph (5.1.3) includes an overview the guidelines and/or legislation that limit exposure at an international level (with emphasis on the EU). No change in the text is required.
Environmental Health Trust	USA	5.4.5 Other	<p>The report should include a section on personal behaviors that the public can take to mitigate future health risk. Examples of recommendations to the public on personal behaviors to minimize exposure include:</p> <p>Do not rest a laptop or electric on your lap. Keep electronics on a table. Do not sleep near a charging cell phone or a charging laptop or digital device. Always charge devices away from sleeping/living spaces and preferable during the daytime. Charging generates high EMFs near the cord and batteries can catch fire during charging.</p> <p>Do not use a cell phone while it is charging as the ELF-EMF field is high. Likewise- try to use your laptop on battery, rather than while charging. Always unplug the laptop once it is charged. Corded alarm clocks and radios can have intense EMFs, so replace your alarm clock with a battery powered alarm clock. This will reduce your exposure at night. Do not sleep with your head or body near a wall that has the electric panel, electric meter or appliance on the other side. Unplug appliances and electronics such as TV's and microwaves ovens when not in use. This reduces ELF and also reduces energy consumption. An easy way to do this for electronics is to get a powerstrip that you can easily switch off. Remove electronics from the bedroom—especially around your bed and the crib.</p> <p>Avoid sleeping with electric blankets and heating pads; if you use an electric blanket to preheat your bed, unplug it before sleeping. If you only turn it off, the EMF will still be present. Do not stand near a microwave oven when it is on. Better yet, use a toaster oven. EMFs from electrical wiring can be reduced if you flip the switch on the breaker for the electrical circuits near the bedroom at night. However circuits are not designed to be flipped every night. Some people use a "kill switch" so all you have to do is flip one switch at night to turn off breakers all at once.</p> <p>Get a magnetic field meter to take measurements in your home. If your ELF measurements show high levels in your home, it could be faulty wiring which an electrician can fix. Often simple fixes can greatly reduce ELF-EMF exposure.</p> <p>Take measurements in your home if you live near powerlines because levels can be high throughout the house from the EMF emanating from high voltage powerlines.</p> <p>EHT recommends protective policies by governments to minimize residential, occupational and school exposures. ICNIRP limits do not protect from effects of long term exposure. We also recommend that for electronics and appliances the ELF emissions be measured by the manufacturer and transparently posted for the consumer. Instructions should include a recommended separation distance so people know to minimize their exposure. Further, industry research and design should focus on significantly mitigating exposures, especially for cars and transportation.</p> <p>See CHPS low EMF criteria that includes ELF</p>	_LOW_EMF_Classroom_Criteria_Collaborative_For_High_Performance_Schools_copy.pdf	Thank you for the comment. This section does not concern exposure mitigation measures, which, in any case are outside the scope of the SCHEER. No change in the text is required.

Environmental Health Trust	USA	5.4.5 Other	<p>The report should include a section on government policies and personal behaviors that can mitigate future health risk. The report should include a section on government (public and occupational) policies and personal behaviors that can mitigate future health risk. Locations include home, school and work.</p> <p>Park et al., 2020's research investigating ELF-EMF levels in schools has found exposure at students' seat positions was mostly caused by electrical appliances, electronic wiring, and distribution boxes and the authors conclude that, "it is important to design safe and appropriate environments for digital learning in schools, such as proper seating arrangements, to avoid ELF-EMFs exposure to students as much as possible."</p> <p>Park J, Jeong E, Seomun G. Extremely Low-Frequency Magnetic Fields Exposure Measurement during Lessons in Elementary Schools. International Journal of Environmental Research and Public Health. 2020; 17(15):5284. <a href="https://doi.org/10.3390/ijerph17155284">https://doi.org/10.3390/ijerph17155284</a></p> <p>Examples of government policies to minimize public ELF-EMF exposure:          ICNIRP recommends a residential magnetic field exposure limit of 2,000 milligauss (mG) and an occupational exposure limit of 10,000 mG, both of which allow levels well in excess of the level associated with childhood leukemia.          Over a dozen countries (including France, Israel, and Germany) already have some level of protective policy to minimize residential ELF-EMF from high voltage transmission lines in place for "sensitive areas" regarding residential magnetic fields due to the consistent associations between residential exposure and childhood leukemia. Sensitive areas are generally defined as areas where children live and play such as schools, kindergartens or recreation areas. Sometimes the definition includes hospitals and residential areas. Several countries recommend residential exposures stay below 4 milligauss.          As an example, the Netherlands, government has recommended local and provincial authorities and electric power transport companies apply a precautionary policy to minimize long-term exposure of children to magnetic fields from high-voltage transmission powerlines and in 2013, the government bought out houses which they determined could not be used as dwellings due to their location under powerlines. In France, the government recommends a "zone of caution" for new buildings with sensitive uses (e.g., hospitals, primary schools, kindergartens) near high-voltage infrastructure. Since 2012, the electricity transmission system operator mandates independent EMF measurements in the vicinity of power lines above 50 kV, and the results are publicly shared by the French health agency ANSES. In 2018, a Report of the Electromagnetic Fields Committee of the Health Council found "indications for a causal relationship" between magnetic fields generated by overhead power lines and the incidence of childhood leukaemia and brain tumors. In 2002, the Israeli Ministry of the Environment set an environmental guideline for magnetic fields in areas of new construction at 10 mG, and in 2013, the Ministers of Environment and Health set a maximum permissible level of exposure to ELF in places of prolonged chronic exposure, such as schools and residences, at 4 mG for those under 15 years old. In Israel, the Ministry of Environmental Protection recommended mitigating EMF in infant incubators.          The Report should include all of the ANSES 2019 Report "Health effects associated with exposure to low-frequency electromagnetic fields" recommendations which include:          Not to build new facilities attended by vulnerable people (hospitals, schools, etc.) immediately next to very-high voltage power lines, or running new power lines over these facilities as well as limiting exposure.</p>	ANSES_Health_effects_associated_with_exposure_to_low-frequency_electromagnetic_fields_.pdf	Thank you for the comment. Please, see the answers to your comments above.
Environmental Health Trust	USA	5.3 Health effects from ELF fields	<p>Section 5.3 on ELF Health Effects needs to include impacts to neurotransmitters. □</p> <p>□</p> <p>Chung YH, Lee YJ, Lee HS, Chung SJ, Lim CH, Oh KW, Sohn UD, Park ES, Jeong JH. Extremely low frequency magnetic field modulates the level of neurotransmitters. Korean J Physiol Pharmacol. 2015 Jan;19(1):15-20. □</p> <p>This study was aimed to observe that extremely low frequency magnetic field (ELF-MF) may be relevant to changes of major neurotransmitters in rat brain. After the exposure to ELF-MF (60 Hz, 2.0 mT) for 2 or 5 days, we measured the levels of biogenic amines and their metabolites, amino acid neurotransmitters and nitric oxide (NO) in the cortex, striatum, thalamus, cerebellum and hippocampus. The exposure of ELF-MF for 2 or 5 days produced significant differences in norepinephrine and vanillyl mandelic acid in the striatum, thalamus, cerebellum and hippocampus. Significant increases in the levels of serotonin and 5-hydroxyindoleacetic acid were also observed in the striatum, thalamus or hippocampus. ELF-MF significantly increased the concentration of dopamine in the thalamus. ELF-MF tended to increase the levels of amino acid neurotransmitters such as glutamine, glycine and γ-aminobutyric acid in the striatum and thalamus, whereas it decreased the levels in the cortex, cerebellum and hippocampus. ELF-MF significantly increased NO concentration in the striatum, thalamus and hippocampus. The present study has demonstrated that exposure to ELF-MFs may evoke the changes in the levels of biogenic amines, amino acid and NO in the brain although the extent and property vary with the brain areas. However, the mechanisms remain further to be characterized.□</p> <p>□</p> <p>□</p>		Thank you for the comment. The reference does not comply with the literature inclusion criteria (see paragraph 4.1). No change in the text is required.

Environmental Health Trust	USA	5.3 Health effects from ELF fields	<p>Section 5.3 on ELF Health Effects needs to include endocrine system impacts and additionally how prolonged occupational co-exposures have found such impacts in several studies. □</p> <p>Documentation that should be included: □</p> <p>Khosravipour M, Gharagozlou F, Kakavandi MG, Nadri F, Barzegar A, Emami K, Athar HV. Association of prolonged occupational co-exposures to electromagnetic fields, noise, and rotating shift work with thyroid hormone levels. <i>Ecotoxicol Environ Saf.</i> 2023 Dec 16;270:115837. □</p> <p>"The levels of T4 hormone were significantly changed per a unit increase in the levels of ELF-EMFs. Compared to the fixed-day workers, we observed workers exposed to shift work had a significantly lower T4 level. For T4 and TSH hormones, we found significant interactions among noise, ELF-EMFs, and shift work variables. In summary, this study warranted that prolonged exposure to ELF-EMFs, noise, and rotating shift work might be associated with thyroid dysfunction." □</p> <p>Rauš Balind S, Manojlović-Stojanoski M, Šošić-Jurjević B, Selaković V, Milošević V, Petković B. An Extremely Low Frequency Magnetic Field and Global Cerebral Ischemia Affect Pituitary ACTH and TSH Cells in Gerbils. <i>Bioelectromagnetics.</i> 2020 Feb;41(2):91-103. doi: 10.1002/bem.22237. Epub 2019 Dec 11. PMID: 31828821. □</p> <p>"The neuroendocrine system can be modulated by a magnetic field and cerebral ischemia as external and internal stressors, respectively. ...In conclusion, an ELF magnetic field and/or 10-min global cerebral ischemia can induce immediate and delayed stimulation of ACTH and TSH synthesis and secretion." □</p> <p>Touitou Y, Selmaoui B, Lambrozo J. Assessment of cortisol secretory pattern in workers chronically exposed to ELF-EMF generated by high voltage transmission lines and substations. <i>Environ Int.</i> 2022 Mar;161:107103. doi: 10.1016/j.envint.2022.107103. Epub 2022 Feb 1. PMID: 35121496. □</p> <p>"We investigated the effects of extremely-low frequency electromagnetic fields (ELF-EMFs; 50 Hz) on the secretion of cortisol in 14 men (mean age = 38.0 ± 0.9 years) working in extra-high voltage (EHV) substations. ...The comparison of the control group (n = 15) and the groups exposed to fields of 0.1-0.3 μT (n = 5) and &gt; 0.3 μT (n = 9), respectively, revealed a significant effect of field intensity on the cortisol secretory pattern. T...This study strongly suggests that chronic exposure to ELF-EMFs alters the peak-time serum cortisol levels. Studies are required on the effect of this disruption in high-risk populations such as children, elderly people, and patients with cancer" □</p>		Thank you for the comment. The references do not comply with the literature inclusion criteria (see paragraph 4.1). No change in the text is required.
Environmental Health Trust	USA	5.3.1 Neoplastic diseases	<p>Section 5.3 needs to include studies on breast cancer including the meta-analysis on male breast cancer.</p> <p>Sen et al 2013 meta-analysis suggests that EMF exposure may be associated with the increase risk of male breast cancer. This issue should be addressed and the 2013 study should be noted. The incidence of male breast cancer is increasing (Zheng G, Leone JP 2022). See also Grundy and Zhao. Male breast cancer should be an area of more research.</p> <p>Sun, J. W., Li, X. R., Gao, H. Y., Yin, J. Y., Qin, Q., Nie, S. F., &amp; Wei, S. (2013). Electromagnetic field exposure and male breast cancer risk: a meta-analysis of 18 studies. <i>Asian Pacific journal of cancer prevention : APJCP</i>, 14(1), 523–528.</p> <p>Abstract</p> <p>"Background: The possibility that electromagnetic fields (EMF) exposure may increase male breast cancer risk has been discussed for a long time. However, arguments have been presented that studies limited by poor quality could have led to statistically significant results by chance or bias. Moreover, data for the last 10 years have not been systematically summarized.</p> <p>Methods and results: To confirm any possible association, a meta-analysis was performed by a systematic search strategy. Totals of 7 case-control and 11 cohort studies was identified and pooled ORs with 95% CIs were used as the principal outcome measures. Data from these studies were extracted with a standard meta-analysis procedure and grouped in relation to study design, cut-off point, exposure assessment method, adjustment and exposure model. A statistical significant increased risk of male breast cancer with EMF exposure was defined (pooled ORs = 1.32, 95% CI = 1.14 -1.52, P &lt; 0.001), and subgroup analyses also showed similar results.</p> <p>Conclusions: This meta-analysis suggests that EMF exposure may be associated with the increase risk of male breast cancer despite the arguments raised."</p> <p>See also Grundy A, Harris SA, Demers PA, Johnson KC, Agnew DA; Canadian Cancer Registries Epidemiology Research Group; Villeneuve PJ. Occupational exposure to magnetic fields and breast cancer among Canadian men. <i>Cancer Med.</i> 2016 Mar;5(3):586-96.</p> <p>"Herein, associations of several measures of occupational MF exposure with breast cancer in men were investigated using data from the population-based case-control component of the Canadian National Enhanced Cancer Surveillance System. ...We found an elevated risk of breast cancer in men who were exposed to ≥0.6 μT (odds ratio [OR] = 1.80, 95% CI = 0.82-3.95) when compared to those with exposures &lt;0.3 μT. Those exposed to occupational MF fields for at least 30 years had a nearly threefold increase in risk of breast cancer (OR = 2.77, 95% CI = 0.98-7.82) when compared to those with background levels of exposure. Findings for the other time-related MF variables were inconsistent. Our analysis, in one of the largest case-control studies of breast cancer in men conducted to date, provides limited support for the hypothesis that exposure to MF increases the risk breast cancer in men."</p> <p>Zhao G, Lin X, Zhou M, Zhao J. Relationship between exposure to extremely low-frequency electromagnetic fields and breast cancer risk: a meta-analysis. <i>Eur J Gynaecol Oncol.</i> 2014;35(3):264-9. PMID: 24984538.</p> <p>"The women's exposure to ELF-EMFs may be the risk factor of breast cancer when they are non-menopausal."</p>		Thank you for the comment. The references do not comply with the literature inclusion criteria (see paragraph 4.1). No change in the text is required.

Environmental Health Trust	USA	5.3.1 Neoplastic diseases	<p>Section 5.3 on ELF Health Effects needs to include skin cancer as some studies have suggested an association between residential ELF and melanoma. This is an area needing more research.</p> <p>Khan, M. W., Juutilainen, J., Naarala, J., &amp; Roivainen, P. (2022). Residential extremely low frequency magnetic fields and skin cancer. <i>Occupational and Environmental Medicine</i>, 79(1), 49–54.</p> <p>“Objective Photoinduced radical reactions have a fundamental role in skin cancer induced by ultraviolet radiation, and changes in radical reactions have also been proposed as a mechanism for the putative carcinogenic effects of extremely low frequency (ELF) magnetic fields (MFs). We assessed the association of melanoma and squamous cell carcinoma with residential MF exposure.</p> <p>Methods All cohort members had lived in buildings with indoor transformer stations (TSs) during the period from 1971 to 2016. MF exposure was assessed based on apartment location. Out of the 225 492 individuals, 8617 (149 291 person-years of follow-up) living in apartments next to TSs were considered as exposed, while individuals living on higher floors of the same buildings were considered as referents. Associations between MF exposure and skin cancers were examined using Cox proportional hazard models.</p> <p>Results The HR for MF exposure <math>\geq 6</math> month was 1.05 (95% CI 0.72 to 1.53) for melanoma and 0.94 (95% CI 0.55 to 1.61) for squamous cell carcinoma. Analysis of the age at the start of residence showed an elevated HR (2.55, 95% CI 1.15 to 5.69) for melanoma among those who lived in the apartments when they were less than 15 years old. This finding was based on seven exposed cases.</p> <p>Conclusions The results of this study suggested an association between childhood ELF MF exposure and adult melanoma. This is in agreement with previous findings suggesting that the carcinogenic effects of ELF MFs may be associated particularly with childhood exposure.”</p>		Thank you for the comment. The references do not comply with the literature inclusion criteria (see paragraph 4.1). No change in the text is required.
Environmental Health Trust	USA	5.3 Health effects from ELF fields	<p>The draft report needs to be updated to include studies on hospital ELF-EMF exposure studies as well as health outcomes after exposure of when exposure is mitigated. Electromagnetic fields within neonatal incubators have been shown to have adverse effects on newborns. Research has found that equipment in the NICU creates low-frequency electromagnetic fields “that can have subtle yet measurable effects on the autonomic nervous system” and preterm infants are especially vulnerable to these effects. A study by Passi et al 2017 that looked at 26 preterm infants from the NICU at Penn State Health Milton S. Hershey Medical Center measured the environmental electromagnetic levels in and around incubators. Then, the researchers electrically grounded the babies to reduce the exposures. They found that the babies autonomic nervous system “is able to sense the electrical environment” and the babies were more relaxed when they were grounded. In 2017 Bellieni and colleagues carried out a review of the current research on electromagnetic fields in neonatal incubators, and concluded, “...future incubators should be conceived following better criteria about EMF emissions, redesigning the incubator components” (Bellieni et al., 2017). Earlier publications by Bellieni and colleagues report similar findings including changes in melatonin production and altered heart rate variability. Due to the vulnerability of newborn babies, preventative and prudent measures should be taken against exposure to electromagnetic fields.</p> <p>Research to include: Bellieni, Carlo Valerio, et al. “Electromagnetic fields in neonatal incubators: the reasons for an alert.” <i>The Journal of Maternal-Fetal &amp; Neonatal Medicine</i> (2017): 1-11.</p> <p>“We retrieved 15 papers that described the EMF exposure in incubators and their biological effects on babies. EMF levels in incubators appear to be between 2 and 100 mG, depending on the distance of the mattress from the electric engine. In some cases they exceed this range. These values interfere with melatonin production or with vagal tone. Even caregivers are exposed to high EMF, above 200 mG, when working at close contact with the incubators.”</p> <p>“A precautionary approach should be adopted in future incubator design, to prevent high exposures of newborns in incubators and of caregivers as well.”</p> <p>Passi, R., et al. “Electrical Grounding Improves Vagal Tone in Preterm Infants.” <i>Neonatology</i> 112 (2017): 187-192.</p> <p>“The background MFD in the NICU was below 0.5 mG, but it ranged between 1.5 and 12.7 mG in the closed incubator. A 60-Hz oscillating potential was recorded on the skin of all infants. With EG, the skin voltage dropped by about 95%. Pre-grounding VT was inversely correlated with the skin potential. VT increased by 67% with EG. After grounding, the VT fell to the pre-grounding level.</p> <p>“The electrical environment affects autonomic balance. EG improves VT and may improve resilience to stress and lower the risk of neonatal morbidity in preterm infants.”</p> <p>Bellieni, C. V., et al. “Electromagnetic fields produced by incubators influence heart rate variability in newborns.” <i>Archives of Disease in Childhood-Fetal and Neonatal Edition</i> 93.4 (2008): F298-F301.</p> <p>“EMFs produced by incubators influence newborns’ heart rate variability (HRV), showing an influence on their autonomous nervous system.”</p> <p>Bellieni, C. V., et al. “Reduction of exposure of newborns and caregivers to very high electromagnetic fields produced by incubators.” <i>Medical Physics</i> 32.1 (2005): 149-152.</p> <p>“EMF values measured in incubators were higher than those to which the general population is exposed. The use of ferromagnetic panels significantly reduces the level of EMFs to which neonates and caregivers are exposed.”</p>		Thank you for the comment. The references do not comply with the literature inclusion criteria (see paragraph 4.1). No change in the text is required.

Environmental Health Trust	USA	5.3 Health effects from ELF fields	<p>The Report needs to include studies of prenatal EMF exposure and outcomes such as asthma, ADHD symptoms, diabetes, fetal growth and congenital heart disease, all outcomes associated with ELF-EMF.</p> <p>Zhao, D., Guo, L., Zhang, R., Zhu, Q., Wang, H., Liu, R., Yan, H., &amp; Dang, S. (2021). Risk of congenital heart disease (CHD) due to exposure to common electrical appliances during early pregnancy: A case-control study. <i>Environmental Science and Pollution Research</i>, 28(4), 4739–4748.</p> <p>"We observed that the mothers exposed to computers (OR: 1.33, 95% CI: 1.03, 1.71), induction cookers (OR: 2.79, 95% CI: 2.19, 3.55), and microwave ovens (OR: 1.53, 95% CI: 1.01, 2.31) during early pregnancy were more likely to give birth to infants with CHD. Mothers who wore radiation protection suits (OR: 0.67, 95% CI: 0.52, 0.87) during early pregnancy decreased the risk of CHD in their neonate. There was an interaction for induction cooker exposure with wore radiation protection suits on CHD (RERI: - 1.44, 95% CI: - 2.48, - 0.39; S: 0.37, 95% CI: 0.16, 0.84; AP: - 0.79, 95% CI: - 1.53, - 0.05). Our study confirmed that exposure to some electrical appliances was associated with a higher risk of CHD, and wearing a radiation protection suit was associated with a lower risk of CHD. Women should therefore reduce the usage of electrical appliances before and during pregnancy."</p> <p>Ren Y, Chen J, Miao M, Li DK, Liang H, Wang Z, Yang F, Sun X, Yuan W. Prenatal exposure to extremely low frequency magnetic field and its impact on fetal growth. <i>Environ Health</i>. 2019 Jan 11;18(1):6.</p> <p>"Compared with girls with lower prenatal ELF-MF exposure, girls with higher exposure had a lower birth weight, thinner skinfold of triceps, abdomen and back, and smaller circumference of head, upper arm and abdomen in all three ELF-MF matrices. The differences were statistically significant for birth weight and most other growth measurements (P &lt; 0.05). These measures had no significant difference between higher and lower prenatal ELF-MF exposure in boys except back skinfold thickness.</p> <p>Conclusion Prenatal exposure to higher ELF-MF levels was associated with decreased fetal growth in girls, but not in boys."</p> <p>Su, X.-J., Yuan, W., Tan, H., Liu, X.-Y., Li, D., Li, D.-K., Huang, G.-Y., Zhang, L.-W., &amp; Miao, M.-H. (2014). Correlation between Exposure to Magnetic Fields and Embryonic Development in the First Trimester. <i>PLOS ONE</i>, 9(6), e101050.</p> <p>"Results:Embryonic bud length was inversely associated with maternal daily MF exposure level;...ConclusionPrenatal MF exposure may have an adverse effect on embryonic development."</p> <p>Li, D.-K., Chen, H., Ferber, J. R., Hirst, A. K., &amp; Odouli, R. (2020). Association Between Maternal Exposure to Magnetic Field Nonionizing Radiation During Pregnancy and Risk of Attention-Deficit/Hyperactivity Disorder in Offspring in a Longitudinal Birth Cohort. <i>JAMA Network Open</i>, 3(3), e201417.</p> <p>"This birth cohort study found that some, but not all, high levels of maternal exposure to magnetic field nonionizing radiation, as captured with a monitoring meter, during pregnancy may have been associated with a higher risk of attention-deficit/hyperactivity disorder in offspring. The associations were not consistent or linear and were primarily for children with attention-deficit/hyperactivity disorder and immune-related comorbidities."</p> <p>Li, D.-K., Chen, H., &amp; Odouli, R. (2011). Maternal Exposure to Magnetic Fields During Pregnancy in Relation to the Risk of Asthma in Offspring. <i>Archives of Pediatrics &amp; Adolescent Medicine</i>, 165(10), 945–950.</p> <p>"a statistically significant linear dose-response relationship was observed between increasing maternal median daily MF exposure level in pregnancy and an increased risk of asthma in offspring"</p>		Thank you for the comment. The references do not comply with the literature inclusion criteria (see paragraph 4.1). No change in the text is required.
Environmental Health Trust	USA	5.3.1 Neoplastic diseases	<p>Section 5.3 on ELF Health Effects needs to include the reviews of Seomun et al 2021 and Brabant et al 2022 associating the risk of childhood leukemia with ELF-MF exposure.</p> <p>The abstract on page 2 and the conclusions on page 21 also needs to be updated to reflect the findings of these reviews which strengthen the evidence base.</p> <p>Seomun, G., Lee, J., &amp; Park, J. (2021). Exposure to extremely low-frequency magnetic fields and childhood cancer: A systematic review and meta-analysis. <i>PLOS ONE</i>, 16(5), e0251628.</p> <p>Abstract: "A total of 33 studies were identified. Thirty studies with 186,223 participants were included in the meta-analysis. Children exposed to 0.2-, 0.3-, and 0.4-μT ELF-MFs had a 1.26 (95% confidence interval [CI] 1.06–1.49), 1.22 (95% CI 0.93–1.61), and 1.72 (95% CI 1.25–2.35) times higher odds of childhood leukemia. In childhood brain tumors, children exposed to 0.2-μT had a 0.95 (95% CI 0.59–1.56) times higher odds, and those exposed to 0.4-μT ELF-MFs had a 1.25 (95% CI 0.93–1.61). Children exposed to 0.2- and 0.4-μT ELF-MFs had a 1.10 (95% CI 0.70–1.75) and 2.01 (95% CI 0.89–4.52) times higher odds of any childhood cancers.</p> <p>Conclusions</p> <p>Significant associations were observed between exposure to ELF-MFs and childhood leukemia. Furthermore, a possible dose-response effect was also observed."</p> <p>Brabant, C., Geerinck, A., Beaudart, C., Tirelli, E., Geuzaine, C., &amp; Bruyère, O. (2022). Exposure to magnetic fields and childhood leukemia: A systematic review and meta-analysis of case-control and cohort studies. <i>Reviews on Environmental Health</i>.</p> <p>Excerpt: " Our global meta-analysis indicated an association between childhood leukemia and ELF-MF (21 studies, pooled OR=1.26; 95% CI 1.06–1.49), an association mainly explained by the studies conducted before 2000 (earlier studies: pooled OR=1.51; 95% CI 1.26–1.80 vs. later studies: pooled OR=1.04; 95% CI 0.84–1.29). Our meta-analyses based only on magnetic field measurements indicated that the magnetic flux density threshold associated with childhood leukemia is higher than 0.4 μT (12 studies, &gt;0.4 μT: pooled OR=1.37; 95% CI 1.05–1.80; acute lymphoblastic leukemia alone: seven studies, &gt;0.4 μT: pooled OR=1.88; 95% CI 1.31–2.70). Lower magnetic fields were not associated with leukemia (12 studies, 0.1–0.2 μT: pooled OR=1.04; 95% CI 0.88–1.24; 0.2–0.4 μT: pooled OR=1.07; 95% CI 0.87–1.30). Our meta-analyses based only on distances (five studies) showed that the pooled ORs for living within 50 m and 200 m of power lines were 1.11 (95% CI 0.81–1.52) and 0.98 (95% CI 0.85–1.12), respectively. The pooled OR for living within 50 m of power lines and acute lymphoblastic leukemia analyzed separately was 1.44 (95% CI 0.72–2.88). Our meta-analyses based only on wire codings (five studies) indicated that the pooled OR for the very high current configuration (VHCC) was 1.23 (95% CI 0.72–2.10). Finally, the risk of childhood leukemia was increased after exposure to electric blankets (four studies, pooled OR=2.75; 95% CI 1.71–4.42) and, to a lesser extent, electric clocks (four studies, pooled OR=1.27; 95% CI 1.01–1.60). Our results suggest that ELF-MF higher than 0.4 μT can increase the risk of developing leukemia in children, probably acute lymphoblastic leukemia. Prolonged exposure to electric appliances that generate magnetic fields higher than 0.4 μT like electric blankets is associated with a greater risk of childhood leukemia.</p>		Thank you for your comments and additional references. The text has been amended.

Environmental Health Trust	USA	5.4.5 Other	<p>The report should include a section dedicated to how sources of fundings can impact results as research finds that all government or independent studies find either a statistically significant association or an elevated risk while almost all industry supported studies fail to find any significant or even suggestive association.</p> <p>At a minimum the review by Carpenter, D. O. (2019) should be referenced with its findings regarding funding source.</p> <p>Extremely low frequency electromagnetic fields and cancer: How source of funding affects results by Carpenter, D. O. (2019) in Environmental Research found "all government or independent studies find either a statistically significant association between magnetic field exposure and childhood leukemia, or an elevated risk of at least OR = 1.5, while almost all industry supported studies fail to find any significant or even suggestive association."</p> <p>Carpenter DO. Extremely low frequency electromagnetic fields and cancer: How source of funding affects results. Environ Res. 2019 Nov;178:108688. doi: 10.1016/j.envres.2019.108688. Epub 2019 Aug 24. PMID: 31476684.</p> <p>"Abstract: While there has been evidence indicating that excessive exposure to magnetic fields from 50 to 60 Hz electricity increases risk of cancer, many argue that the evidence is inconsistent and inconclusive. This is particularly the case regarding magnetic field exposure and childhood leukemia. A major goal of this study is to examine how source of funding influences the reported results and conclusions. Several meta-analyses dating from about 2000 all report significant associations between exposure and risk of leukemia. By examining subsequent reports on childhood leukemia it is clear that almost all government or independent studies find either a statistically significant association between magnetic field exposure and childhood leukemia, or an elevated risk of at least OR = 1.5, while almost all industry supported studies fail to find any significant or even suggestive association. A secondary goal of this report is to examine the level of evidence for exposure and elevated risk of various adult cancers. Based on pooled or meta-analyses as well as subsequent peer-reviewed studies there is strong evidence that excessive exposure to magnetic fields increases risk of adult leukemia, male and female breast cancer and brain cancer. There is less convincing but suggestive evidence for elevations in several other cancer types. There is less clear evidence for bias based on source of funding in the adult cancer studies. There is also some evidence that both paternal and maternal prenatal exposure to magnetic fields results in an increased risk of leukemia and brain cancer in offspring.</p> <p>When one allows for bias reflected in source of funding, the evidence that magnetic fields increase risk of cancer is neither inconsistent nor inconclusive. Furthermore adults are also at risk, not just children, and there is strong evidence for cancers in addition to leukemia, particularly brain and breast cancer."</p>		Thank you for the comment. This aspect is always considered by the SCHEER in the weight of evidence approach. No dedicated section is necessary.
Environmental Health Trust	USA	5.2 Interaction mechanisms	<p>The section on mechanisms (including on oxidative stress) needs to include Lai and Levitt 2023, Panagopoulos et al 2021, Georgiou, C. D., &amp; Margaritis, L. H. (2021), Barnes and Greenebaum 2015 and Barnes, F., &amp; Freeman, J. E. R. (2022). This information should be incorporated into the Abstract and opinion section.</p> <p>Lai, H., &amp; Levitt, B. B. (2023). Cellular and molecular effects of non-ionizing electromagnetic fields. Reviews on Environmental Health. "The way that living cells respond to non-ionizing electromagnetic fields (EMF), including static/extremely-low frequency and radiofrequency electromagnetic fields, fits the pattern of 'cellular stress response' – a mechanism manifest at the cellular level intended to preserve the entire organism. It is a set pattern of cellular and molecular responses to environmental stressors, such as heat, ionizing radiation, oxidation, etc. It is triggered by cellular macromolecular damage (in proteins, lipids, and DNA) with the goal of repairing and returning cell functions to homeostasis. The pattern is independent of the type of stressor encountered. It involves cell cycle arrest, induction of specific molecular mechanisms for repair, damage removal, cell proliferation, and cell death if damage is too great. This response could be triggered by EMF-induced alternation in oxidative processes in cells. The concept that biological response to EMF is a 'cellular stress response' explains many observed effects of EMF, such as nonlinear dose- and time-dependency, increased and decreased risks of cancer and neurodegenerative diseases, enhanced nerve regeneration, and bone healing."</p> <p>Georgiou, C. D., &amp; Margaritis, L. H. (2021). Oxidative Stress and NADPH Oxidase: Connecting Electromagnetic Fields, Cation Channels and Biological Effects. International Journal of Molecular Sciences, 22(18), 10041.</p> <p>" Electromagnetic fields (EMFs) disrupt the electrochemical balance of biological membranes, thereby causing abnormal cation movement and deterioration of the function of membrane voltage-gated ion channels. These can trigger an increase of oxidative stress (OS) and the impairment of all cellular functions, including DNA damage and subsequent carcinogenesis. In this review we focus on the main mechanisms of OS generation by EMF-sensitized NADPH oxidase (NOX), the involved OS biochemistry, and the associated key biological effects."</p> <p>Barnes FS, Greenebaum B. The effects of weak magnetic fields on radical pairs. Bioelectromagnetics. 2015</p> <p>"Changes in the pair recombination rates can change radical concentrations and modify biological processes. The overall conclusion is that the application of magnetic fields at frequencies ranging from a few Hertz to microwaves at the absorption frequencies observed in electron and nuclear resonance spectroscopy for radicals can lead to changes in free radical concentrations and have the potential to lead to biologically significant changes. "</p> <p>Barnes, F., &amp; Freeman, J. E. R. (2022). Some thoughts on the possible health effects of electric and magnetic fields and exposure guidelines. Frontiers in Public Health, 10.</p> <p>"experimental results showing both increases and decreases in cancer cell growth rates and concentration of reactive oxygen species for exposure to nano-Tesla magnetic fields at both radio frequencies (RF) and extra low frequencies (ELF) are cited in this paper. Some theoretical models on how variations in EM exposure can lead to different biological outcomes and how feedback and repair processes often mitigate potential health effects due to long-term exposure to low-level EM energy sources are presented."</p>		Thank you for the comment. The references do not comply with the literature inclusion criteria (see paragraph 4.1). No change in the text is required.



Environmental Health Trust	USA	5.3.4 Reproductive and Developmental effects	<p>The statement in the abstract opinion and section 5.3.4 that, "the available systematic reviews and meta-analyses have not shown an association between ELF-EMF exposure and pregnancy or reproductive outcomes" should be corrected to reflect the systematic reviews that have found associations with miscarriage.</p> <p>Zhou et al. (2022) was cited in the draft report but this study was only focused on residential exposure (omitting device/appliance exposures) and that should be clarified.</p> <p>Importantly, the published systematic reviews that have found associations with miscarriage and preterm birth should be included such as Irani 2023 and Ghazanfarpor 2021. Both found associations with miscarriage and they considered the increasing use of appliances and devices that generate EMF in homes, in industries and in the medical field.</p> <p>We note that there can be significant occupational exposures to ELF during pregnancy. Women also will go on bedrest during pregnancy with a laptop on their lap, unaware of the ELF exposure.</p> <p>Irani M, Aradmehr M, Ghorbani M, Baghani R. Electromagnetic Field Exposure and Abortion in Pregnant Women: A Systematic Review and Meta-Analysis. Malays J Med Sci. 2023</p> <p>"The results of the random-effects meta-analysis indicated that EMF exposure had a significant effect on miscarriage: rate ratio (RR) = 1.699; 95% confidence interval (CI): 1.121, 2.363 (P &lt; 0.001); and heterogeneity (I<sup>2</sup>) = 84.55% (P &lt; 0.001). The findings showed that pregnant woman who were exposed to high levels of EMF had an increased risk of miscarriage."</p> <p>Ghazanfarpor, M., Kashani, Z. A., Pakzad, R., Abdi, F., Rahnamaei, F. A., Akbari, P. A., &amp; Roozbeh, N. (2021). Effect of electromagnetic field on abortion: A systematic review and meta-analysis. <i>Open Medicine (Warsaw, Poland)</i>, 16(1), 1628–1641.</p> <p>"Effect of electromagnetic field on abortion: A systematic review and meta-analysis" found exposure to EMFs above 50 Hz or 16 mG is associated with 1.27x increased risk of abortion. "It may be prudent to advise women against this potentially important environmental hazard."</p> <p>Additional Notable Studies to include reference to:</p> <p>Li, D.-K., Chen, H., Ferber, J. R., Odouli, R., &amp; Quesenberry, C. (2017). Exposure to Magnetic Field Non-ionizing Radiation and the Risk of Miscarriage: A Prospective Cohort Study. <i>Scientific Reports</i>, 7(1), 17541.</p> <p>Li, D.-K., Odouli, R., Wi, S., Janevic, T., Golditch, I., Bracken, T. D., Senior, R., Rankin, R., &amp; Iriye, R. (2002). A population-based prospective cohort study of personal exposure to magnetic fields during pregnancy and the risk of miscarriage. <i>Epidemiology (Cambridge, Mass.)</i>, 13(1), 9–20.</p> <p>"Although the potential mechanisms of a possible MMF effect on the risk of miscarriage are not currently well understood, early fetuses are known to be sensitive to environmental insults. A disruption of early fetal development at the cellular or molecular level by external MFs could conceivably result in fetal death. Despite the lack of clear understanding of the underlying mechanisms, these findings raise the question of a possible effect of MMF on early fetal loss."</p> <p>"The robustness of the association between MMF and miscarriage risk against potential confounders was supported by evidence that despite adjustment for more than 30 variables of known or suspected risk factors for miscarriage, the estimates were barely altered."</p> <p>"Our findings provide strong prospective evidence that prenatal maximum magnetic field exposure above a certain level (possibly around 16 mG) may be associated with miscarriage risk. This observed association is unlikely to be due to uncontrolled biases or unmeasured confounders."</p>		Thank you for the comment. The references were considered by the SCHEER but they are not useful for the risk assessment of low frequency EMF, since they do not study exposure in this frequency range separately. No change in the text is required.
Environmental Health Trust	USA	2.5 Environmental effects from LF-EMF	<p>The opinion on page 9 should include a description of the findings to flora and fauna from research studies on ELF exposure such as impacts to behavior, altered metabolism, reduced reproductive capacity, oxidative stress, impaired memory, DNA damage and developmental effects.</p> <p>Currently, the draft (page 2 starting on line 39) only states, "The exposure of animals and plants to ELF-EMFs may become higher than that of humans, if they are close to anthropogenic sources in the environment. Moreover, animals and plants possess receptors and structures not existing in humans, which could give rise to species specific biological effects." This omits the studied endpoints such as documented by Levitt et al 2021 that, "broad wildlife effects have been seen on orientation and migration, food finding, reproduction, mating, nest and den building, territorial maintenance and defense, and longevity and survivorship. Cyto- and geno-toxic effects have been observed."</p> <p>Please add a summary of the list of findings documented in the published reviews to this section, just as you did with the section on human health.</p> <p>As an example, Thill et al 2023 reviewed studies on altered behavior, altered enzyme activity, altered metabolism, reduced reproductive capacity, oxidative stress, impaired memory, DNA damage and developmental effects. These issues should be specifically listed in the opinion section.</p> <p>We note that wireless communications signals are complex and have ELF components. As detailed by Panagopoulos, D. J., Karabarounis, A., Yakymenko, I., &amp; Chrousos, G. P. (2021). Human made electromagnetic fields: Ion forced oscillation and voltage gated ion channel dysfunction, oxidative stress and DNA damage (Review). <i>International Journal of Oncology</i>, "Abstract: Exposure of animals/biological samples to human made electromagnetic fields (EMFs), especially in the extremely low frequency (ELF) band, and the microwave/radio frequency (RF) band which is always combined with ELF, may lead to DNA damage. DNA damage is connected with cell death, infertility and other pathologies, including cancer. ELF exposure from high voltage power lines and complex RF exposure from wireless communication antennas/devices are linked to increased cancer risk. Almost all human made RF EMFs include ELF components in the form of modulation, pulsing and random variability. Thus, in addition to polarization and coherence, the existence of ELFs is a common feature of almost all human made EMFs. The present study reviews the DNA damage and related effects induced by human made EMFs. The ion forced oscillation mechanism for irregular gating of voltage gated ion channels on cell membranes by polarized/coherent EMFs is extensively described. Dysfunction of ion channels disrupts intracellular ionic concentrations, which determine the cell's electrochemical balance and homeostasis. The present study shows how this can result in DNA damage through reactive oxygen species/free radical overproduction. Thus, a complete picture is provided of how human made EMF exposure may indeed lead to DNA damage and related pathologies, including cancer. Moreover, it is suggested that the non thermal biological effects attributed to RF EMFs are actually due to their ELF components."</p>	Human_made_electromagnetic_fields- ion_forced_oscillation_and_voltage_gated_ion_channel_dysfunction_oxidative_stress_and_DNA_damage_Review_PANAGOPOULOS_2021Review_.pdf	Thank you for the comment. The reference does not comply with the literature inclusion criteria (see paragraph 4.1). No change in the text is required.

Environmental Health Trust	USA	5.5 Effects from low frequency fields on fauna and flora	<p>Effects from low frequency fields on fauna and flora should include the latest literature reviews and systematic reviews on impacts to flora and fauna.</p> <p>The Report needs to include the three part literature reviews of Levitt et al 2021 as well as the systematic review by Thill et al 2023. Further, numerous studies on combined exposures with EMF need to be added to the cited research. Molina-Montenegro et al. (2023) Electromagnetic fields disrupt the pollination service by honeybees and Piechowicz et al 2020 need to be included alongside the two studies by Lupi.</p> <p>The current draft has only Pophof et al. (2023) which simply summarizes a short 2019 conference. This is inadequate and deficient. Pophof et al. (2023) is well outdated with science published at or older than 2019.</p> <p>Thill A, Cammaerts MC, Balmori A. Biological effects of electromagnetic fields on insects: a systematic review and meta-analysis. Rev Environ Health. 2023 Nov 23</p> <p>"Biological effects of non-thermal EMF on insects are clearly proven in the laboratory, but only partly in the field, thus the wider ecological implications are still unknown. There is a need for more field studies, but extrapolating from the laboratory, as is common practice in ecotoxicology, already warrants increasing the threat level of environmental EMF impact on insects."</p> <p>Levitt BB, Lai HC and Manville AM II (2022) Low-level EMF effects on wildlife and plants: What research tells us about an ecosystem approach. Front. Public Health 10:1000840. doi: 10.3389/fpubh.2022.1000840</p> <p>"Any existing exposure standards are for humans only; wildlife is unprotected, including within the safety margins of existing guidelines, which are inappropriate for trans-species sensitivities and different non-human physiology."</p> <p>Levitt, B. B., Lai, H. C., &amp; Manville, A. M. (2021b). Effects of non-ionizing electromagnetic fields on flora and fauna, Part 2 impacts: How species interact with natural and man-made EMF. Reviews on Environmental Health, 37(3), 327–406.</p> <p>"Broad wildlife effects have been seen on orientation and migration, food finding, reproduction, mating, nest and den building, territorial maintenance and defense, and longevity and survivorship. Cyto- and geno-toxic effects have been observed. "</p> <p>Molina-Montenegro MA, Acuña-Rodríguez IS, Ballesteros GI, Baldeomar M, Torres-Díaz C, Broitman BR, Vázquez DP. (2023) Electromagnetic fields disrupt the pollination service by honeybees. Sci Adv. May 12;9(19)</p> <p>"EMF exposure exerted strong physiological stress on honeybees as shown by the enhanced expression of heat-shock proteins and genes involved in antioxidant activity and affected the expression levels of behavior-related genes. Moreover, California poppy individuals growing near EMF received fewer honeybee visits and produced fewer seeds than plants growing far from EMF. Last, we found a hump-shaped relationship between EMF and plant species richness and plant abundance. Our study provides conclusive evidence of detrimental impacts of EMF on honeybee's pollination behavior, leading to negative effects on plant community."</p> <p>Piechowicz B, Sadlo S, Woś I, Białek J, Depciuch J, Podbielska M, Szpyrka E, Koziol K, Piechowicz I, Kozirowska A. Treating honey bees with an extremely low frequency electromagnetic field and pesticides: Impact on the rate of disappearance of azoxystrobin and λ-cyhalothrin and the structure of some functional groups of the probabilistic molecules. Environ Res. 2020 Nov;190:109989</p> <p>"The obtained results indicate that EMF may affect the rate of metabolism and the detoxification process of pesticides in bees..."</p>		Thank you for your comments and additional references. The text has been amended.
National Institute for Public Health and the Environment	Netherlands	5.3.1 Neoplastic diseases	<p>Reference is made to the systematic review and meta-analysis on low frequency EMF and cancer in children by the Health Council of the Netherlands (2018). However, no mention is made of the following systematic review and meta-analyses on low frequency EMF and cancer in adults by the Health Council from 2022: <a href="https://www.healthcouncil.nl/documents/advisory-reports/2022/06/29/power-lines-and-health-cancer-in-adults">https://www.healthcouncil.nl/documents/advisory-reports/2022/06/29/power-lines-and-health-cancer-in-adults</a></p> <p>This omission is surprising, since SCHEER does include (in paragraph 5.3.2.1) the Health Council reports on low frequency EMF and neurodegenerative diseases in adults from the same year (2022). A summary of the Health Council's findings on low frequency EMF and cancer in adults should logically be added to paragraph 5.3.1.1.</p>		Thank you for the comment. The text has been amended.
National Institute for Public Health and the Environment	Netherlands	4.1 Data/Evidence	<p>In section 4.1 (Data/Evidence), SCHEER states that "The scientific assessments carried out should always be based on scientifically accepted approaches, and be transparent with regard to the data, methods and assumptions that are used in the risk assessment process". Reference is made to SCHEER's Memorandum on Weight of Evidence (WoE) and uncertainties (2018). Neither here, nor elsewhere in the preliminary Opinion, is any description given of the search criteria and outcome, selection criteria and quality assessment. In the interest of transparency, reproducibility and quality control, it is important that the final Opinion adds more information on the literature search methods, selection criteria and quality criteria (including a motivation for focusing on systematic reviews, meta-analyses and reports, as was provided in the previous SCHEER Opinion on radiofrequency EMF, paragraph 4.3.2). It would also be very helpful if the final version of the Opinion included a weight of evidence table with grading of all included reviews, similar to the table provided with previous Opinion on radiofrequency EMF (<a href="https://health.ec.europa.eu/system/files/2023-05/emf_woe_approach_sources_en.pdf">https://health.ec.europa.eu/system/files/2023-05/emf_woe_approach_sources_en.pdf</a>).</p>		Thank you for the comment. The text has been amended to make the selection criteria clearer. The table with the scoring of each study will be provided.
	USA	2 OPINION	<p>INVOKE THE PRECAUTIONARY PRINCIPLE</p> <p>Section 2: Lines 11, 33-35</p> <p>"The precautionary principle is an approach to risk management, where, IF IT IS POSSIBLE [emphasis added] that a given policy or action might cause harm to the public or the environment and if there is still no scientific agreement on the issue, the policy or action in question should not be carried out." <a href="https://eur-lex.europa.eu/EN/legal-content/glossary/precautionary-principle.html">https://eur-lex.europa.eu/EN/legal-content/glossary/precautionary-principle.html</a></p> <p>"The Recommendation also invites the Commission to "keep the matters covered by this recommendation under review, with a view to its revision and updating, taking into account POSSIBLE EFFECTS [emphasis added], which are CURRENTLY THE OBJECT OF RESEARCH [emphasis added], including relevant aspects of PRECAUTION [emphasis added] (paragraph 4)".</p> <p><a href="https://health.ec.europa.eu/system/files/2023-11/scheer_o_063.pdf">https://health.ec.europa.eu/system/files/2023-11/scheer_o_063.pdf</a></p> <p>11: "MORE RESEARCH IS NEEDED... [emphasis added]"</p> <p>33-35: "NO [emphasis added] systematic reviews or meta-analyses could be identified on exposure to ELF-EMF and neurophysiological outcomes. Therefore, it is STILL NOT POSSIBLE [emphasis added] to draw a definite conclusion on POTENTIAL EFFECTS [emphasis added]."</p> <p>Carol Taccetta, MD, FCAP (Fellow of College of American Pathologists)</p>		Thank you for the comment.
Saving trees with frequencies	Belgium	5.1.2 Low frequency (LF) fields	<p>Dear</p> <p>Are the frequencies used by the systems to modificate the weather, included in the LF fields, mentioned in your study cases ? And the interferences with the chemicals used to influence the weather ? Do you know/understand that the frequencies used for geo-engineering are damaging the immunity system of all trees ? Many of them will die in the next years. Geo-engineering is a fact; the consequences on nature and human beings also.</p> <p>Sincerely</p>	Geoengineering_in_the_EU_Final.pdf	Thank you for the comment. We have included a brief overview of the literature about low-frequency EMF effects on flora and fauna. However, a detailed review of these effects is outside the scope of this Opinion.

Saved Trees	Belgium	2.5 Environmental effects from LF-EMF	Are the EMFields also including the frequencies and influences of the weather modification systems, used in Europe ? If not, than you have to adjust this and to notice that this frequencies (strange to the Earth !) used by HAARP e.a. are damaging continuously the immunity of trees (and human beings). You may expect you on a great death of many trees in Europe in het next years and an increasing amount of all disaeses and pests in nature and towns. Every frequency is interfering wicht electricitiy, also disturbances !! That's the great reason of the great bio-degration of fauna and flora in Europe (and not the Nitrification of agriculture). □ What do you know about the role/inflence of the GSM systems and the daily weather modification ?? We will see many dead trees in het near future in landscapes, gardens, bushes, .... ! □ Trees and human beings are electromagnetical creatures, their life and vitality is connected to (many positif) frequencies. □ Sincerely,		Thank you for the comment. We have included a brief overview of the literature about low-frequency EMF effects on flora and fauna. However, a detailed review of these effects is outside the scope of this Opinion.
Erupeans for Safe Connections	Netherlands	5 ASSESSMENT	For Chapter 5 we have:□ a text in the word file named comment 2 and 4 □ □ For Para 5.3.1.1 we have:□ a text in a word file named comment 3□ □ For Para 5.3.6 we have:□ a text in a word filenamed comment 5□ a PDF Containing Annex4	ESC_Comment_SCHEER_Opinion ELF_EMF_comment2_and_4_chapter5.docx;ESC_Co mment_SCHEER_Opinion ELF_EMF_comme nt3_chapter5_art5_3_1_1.docx;ESC_Commen t_SCHEER_Opinion_E LF_EMF_comment5_c hapter5_art5_3_6.docx; ESC_Comment_SCHE ER_Opinion ELF_EMF _EHS_annex4_chapter _5_art_5_3_6.pdf	Thank you for your comments. The methodology employed to answer the ToR is described in section 4 of the Opinion, where the literature search and inclusion criteria are mentioned.  Literature/evidence sources that had been missed in the preliminary Opinion, but fulfil the inclusion criteria, have now been given due consideration within the WoE approach taken by the SCHEER; the text has been amended accordingly where necessary.  In the Opinion, we have included a brief overview of the literature about low-frequency EMF effects on flora and fauna. However, a detailed review of these effects is outside the scope of this Opinion.  The SCHEER is confident that WGs are formed to respond to the ToR of each mandate including the necessary and sufficient expertise to carry out their task.  Rules about the selection of external experts through an open call, the potential conflicts of interest of members of the committees and external experts in the WGs are described in the rules of procedures of the Scientific Committees which are available on the respective website ( <a href="https://health.ec.europa.eu/document/download/8dc24a70-8bf9-4f44-b0fa-de1f4b42a69e_en?filename=rules_procedure_2016_en.pdf">https://health.ec.europa.eu/document/download/8dc24a70-8bf9-4f44-b0fa-de1f4b42a69e_en?filename=rules_procedure_2016_en.pdf</a> )
Europeans for Safe Connections	Netherlands	2 OPINION	- a text in the word file named comment 1□ a PDF Containing Annex 1,2, and 3	ESC_Comment_SCHEER_Opinion ELF_EMF_comment1_chapter2.d ocx;ESC_Comment_S CHEER_Opinion ELF_EMF__annex1_2_and_3_Chapter2.pdf	Please, see answer above.
Europeans for Safe Connections	Netherlands	2 OPINION	a global overview	ESC_Comment_SCHEER_Opinion ELF_EMF__completely.pdf	Please, see answer above.
member of AREHS (Association pour la Reconnaissanc e d' Electrohypersensibilité)	Belgium	5.4.6 Conclusions on health effects from IF fields	I am suffering from electrohypersensitivity since 2010. At that time I lived in the historic city of Mechelen (Belgium) but could not cope anymore with the WIFI/DECT/... of my neighbors. In 2011 I decided to move to the Ardennes in the southern part of Belgium. In my new built house (with bio-electricity) and huge garden it is most of the time OK and as long as I stay at home I can survive more or less. But as soon as I leave my place and expose my self to a high level of EMF's I become terribly sick : brain fog, dizziness, palpitations, extreme fatigue, inflammations of all kind, ..and it takes 1 to 2 weeks to recover. ; so I avoid going out, which means I have no social life anymore. And even in a small village surrounded by beautiful nature my life as an EHS person becomes more and more difficult with the increasing levels of EMF's. At night I have to cut all electricity (dirty electricity from neighbors), if not I do not sleep well. If I want to see somebody I have to invite them in my house and ask to swing off their mobile. No way I can go to somebody else's house. Most people have no idea how much EHS people suffer from being excluded from any form of social contact.		Thank you for the comment.
VEHS Vlaanderen	Belgium	5.3.6 IEI-EMF and symptoms	We have comments on:□ -Article 5.3.6, page 25, line numbers 40-42□ -Article 2.3, p 9, line numbers 15-18□ -References, p 30-34, line numbers 1-50□ It is not correct that no reviews have been done on the exposure to ELF-EMF and IEI-EMF (electromagnetic hypersensitivity) or symptoms. We refer to the review by Leszczynski in 2021 and by Stein&Udasin in 2020. Leszczynski's review, for example, also covers ELF-EMF. See more explanation and references in annex.□	VEHS_Critique_SCHEER_Opinion ELF_EMF _EHS.pdf	Thank you for the comment. The text has been amended.

	Belgium	5.4.6 Conclusions on health effects from IF fields	There is sufficient information and research available to support reasonable doubt about the health effects of ELF-EMF. If the committee finds there is insufficiently proper research, this should be organized. In case of any doubt, regulations should be adjusted to safeguard all citizens from even the furthest possibility of negative effects.		Thank you for the comment.
Federal Office for Radiation Protection	Germany	5.3.4 Reproductive and Developmental effects	<p>p 25, I 2-25: As in Sections 5.3.1 and 5.3.2.1 on the epidemiological studies investigating neoplastic and neurodegenerative diseases as outcomes, the search and selection criteria for the reviews summarized in Section 5.3.4.1 are not presented for the epidemiological studies on the effects of ELF EMF on reproduction and development (of fetuses and/or newborns and/or children?).</p> <p>P25, I 10-16: In the description of the Zhou study, it should be described more precisely that only the exposure of pregnant women who live near extremely low frequency electromagnetic fields caused by power lines is examined and only the evidence from cohort studies is used. The search strategy is also not completely convincing, e.g. it contains the term 'abortion' but not the terms 'miscarriage' and 'fetal death'. This may be the reason why e.g. the publication by Li (2017) [Li DK, Chen H, Ferber JR et al. (2017): Exposure to Magnetic Field Non-Ionizing Radiation and the Risk of Miscarriage: A Prospective Cohort Study. Sci Rep 7:17541 doi:10.1038/s41598-017-16623-8] were not included in the meta-analysis by Zhou. Furthermore the authors' practice of publishing their paper a second time with the same title and content (see F. Zhou; C. Ma; Y. J. Li; M. Zhang; W. Liu. Effect of extremely low-frequency electromagnetic radiation on pregnancy outcome: A meta-analysis, Afr J Reprod Health, 27(2023), 5, 95-104. <a href="https://doi.org/10.29063/ajrh2023/v27i5.9">https://doi.org/10.29063/ajrh2023/v27i5.9</a>, <a href="https://www.ajrh.info/index.php/ajrh/article/view/3859">https://www.ajrh.info/index.php/ajrh/article/view/3859</a>) is disconcerting.</p> <p>p 25, I 17-20: Even if the study by Darbandi (2018) is not relevant for the risk assessment due to methodological shortcomings, it would be good if it were mentioned in the text that the study has male fertility as endpoint.</p>		<p>Thank you for your comment. The text has been amended.</p> <p>Thank you for the comment. No change in the text is required.</p>