

Summary

This report compiles scientific literature on extremely low frequency electric and magnetic fields (LF-EMF; specifically 50/60 Hz and 16.7 Hz) and is an update of the Synthesis Report last published in 2017. The focus is on biological and health effects. In addition, it addresses the research status in social science with regard to perception, communication and acceptance, as well as selected issues in the field of electromagnetic compatibility (EMC) of some newer low frequency technologies. The report further deals with issues of exposure assessment and low frequency exposures encountered in everyday life and at the workplace. It starts with an overview of sources of NF-EMF from the power supply and from selected power applications. When addressing potential health effects, it first mentions the publications listed in the 2017 report and then comments the more recent literature published since then and until mid-2022. The focus is on epidemiological and experimental human studies on childhood leukemia, other cancers, neurodegenerative diseases, fertility, pregnancy and childbirth, electromagnetic hypersensitivity, and some other selected effects. Almost all studies refer to magnetic field exposures. Electric fields as encountered in everyday life are comparatively unproblematic from a health point of view. Experimental studies with cells or animal models are used to confirm findings from human studies and to investigate possible mechanisms of action. These are described here only selectively and are essentially limited to the period from 2017 to mid-2022. With regard to biological health and social science research, the need for research resulting from the current state of knowledge is presented in a separate section in each case. Overall, the literature review shows that science has not identified any major health risks in recent years, but that there is a need for research in several areas, especially also regarding mechanisms of action. The goal must be to use better data to more robustly assess risks that are not yet clearly assessable today. Research is also still needed for estimating population exposure in connection with new technologies as well as research in the field of social science, for example in connection with acceptance issues. These assessments have not changed significantly compared to the 2017 report.