ELECTRICITY ACT 1989
TOWN AND COUNTRY PLANNING (SCOTLAND) ACT 1997
DPEA CODE OF PRACTICE FOR ELECTRICITY ACT INQUIRIES

TEALING TO KINTORE UPGRADE PROJECT (TKUP) TRI-120-1

PUBLIC HEALTH - HEALTH IMPACT OF ELECTROMAGNETIC FIELDS by Iain Stirling

INTRODUCTION

I am Dr. Iain Stirling, a retired GP and an Occupational/Environment Physician. I hold the degrees of MB ChB from the University of London, Royal Free Hospital 1983 & Bsc ARCS Hons. Chemistry degree from Imperial College, London 1977 . I have postgraduate qualifications MRCGP (1989), DRCOG (1987), DDAM (2002), DOccMed (2011)

I practiced medicine from August 1983 to March 2022 for 39 years. I was a GP from 1989-2010, then a GP with Special interest in Occupational health NHS Grampian 2008-2016. I continue to be registered with the General Medical Council and sit as a Medical member of the First Tier Tribunals Social Security Scotland. I have done UK and Scottish First Tier tribunal work since 2011.

CONCERNS

Potential health impacts have been scoped out of the EIAR for the Tealing to Kintore (TKUP) proposed overhead line application (OHL), on the premise that SSEN follows the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines. The guidelines have significant limitations, and growing recent scientific research suggests an associative link between electromagnetic fields (EMFs) and cancer-related effects on human health. I have limited space, but I hope I will cover the subject in a coherent way.

The project's combined physical, social, and mental health impacts require serious attention, reinforcing the need to explore modern engineering alternatives that avoid such health risks.

The omission of a Health Impact Assessment (HIA) results in the decisionmaking authority not being in possession of all relevant information. In Autumn 2024 Public Health Scotland (PHS) stated .. "*it is the responsibility of the transmission operator to produce a HIA*"... This was confirmed by the Director of Public Health Scotland Medical Director on 8th January 2025. He added that the advice that an HIA should be produced was given to him from Scottish Government colleagues. The Scottish Government (SG) confirmed in Spring 2025 that an HIA will not be included with the EIA. SG also stated they will not do a review of the Scientific Health Literature or investigate real long-term costs of pylon alternatives which include undersea/underground cabling. It is the practice of the ECU to accept the contents

of EIARs as being accurate, reliable and truthful. Where there is genuine doubt, we do not understand that reasoning at all.

Another important consequence of 'scoping out' is that Public Health Scotland is not engaged in the process as consultees. If a HIA were to be required PHS would expect to take a full part in the process. Health impacts should not have been scoped out of the EIA. It therefore falls to the potentially affected members of the public to raise these issues.

The proposed pylons, reaching up to 70 m in height and capable of transmitting 6 GW at 400 kV, 5,000amps will carry about twice the power of the existing lines. This makes the TKUP the most powerful overhead line ever planned in Scotland—where total electricity usage for the whole country is just over 3 GW. There are significant, yet unresearched, health concerns linked to this very large-scale infrastructure.

A substantial body of epidemiological research shows a strong link between long-term exposure to electromagnetic fields (EMFs) and serious health issues, including cancer. This association is supported by numerous meta-analyses and systematic reviews involving large populations, as documented by Ahlborn (2001), Brabant et al. (2023), Carpenter et al. (2019), Malagoli et al. (2023), and Zang et al. (2016). (See references endnote)

Scientists have urged a re-evaluation of current exposure limits, citing evidence of health risks from as distant as 300 metres (Carpenter et al., 2019) and even up to 1 kilometre (Matthews et al., 2024), highlighting the urgency of reassessing safety standards (Calvente et al., 2010). Almost all government/independent, not power industry, studies suggest that current plans could pose a significant public health risk.

Studies (Halgamuge et al, 2013) suggest EMF vibrations may be detected by the pineal gland as light, disrupting melatonin production and sleep. This interference could lead to long-term health effects in humans. These findings align with a WHO- and ICNIRP-recognized study showing increased suicide rates among male electricity utility workers, linked to melatonin disruption and depression. Van Wijngaarden et al. (2000) called for further investigation. The 2024 SCHEER Review highlights additional mechanisms by which EMF exposure may impact health.

Families affected by the OHL project are deeply concerned about the well-established link between prolonged EMF exposure and childhood leukaemia, with studies showing at least a 50% increased risk (Carpenter et al, 2019). The National Radiological Protection Board (NRPB) acknowledged this risk in 2003, and a 2024 SCHEER Review confirmed heightened association risks of leukaemia, Motor Neuron Disease (ALS), and Alzheimer's from EMF exposure.

In Spring 2025, Scottish Minister Jenni Minto acknowledged to the Scottish Parliament public concern over EMF health effects. A major 2023 Italian study (Malagoli et al, 2023) found that children under 15 living within 100 m of high-voltage lines had double the risk of leukaemia, with risk increasing by proximity. Italy enforces stricter EMF regulations than EU recommendations, with limits as low as 0.2 µT in some regions.

Exposure of children to power-frequency magnetic fields warrants engagement of the Precautionary Principle (Dämvik et al, 2010). Animal studies show EMF exposure during development can disrupt cells and potentially lead to cancer (Asian, 2017). SSEN's plan to route a 6GW overhead line near several primary schools is a serious and potentially harmful intervention.

SSEN states that it follows ICNIRP guidelines, but these are criticised as inadequate by some scientists. Harmful effects occur well below ICNIRP limits (Hardell et al, 2021). Appeals to the UN in 2015 and 2024 (UN appeals) by 250 scientists from 44 countries highlighted that the guidelines ignore long-term, low-intensity exposure and fail to protect public health. Despite growing evidence, ICNIRP has not lowered its limits, which remain twice as high as EU reference levels. (Belpomme et al, 2018).

The UK has weaker EMF and voltage regulations than most of Europe. SSEN uses a voluntary EMF limit of 360 µT, while most European countries follow a mandatory 100 µT limit. For voltage, SSEN allows 9000 V/m, compared to Europe's 5000 V/m—the threshold for microshocks. With TKUP rated at 8220 V/m, SSEN is knowingly exposing people to microshock risk.

Conflicts of interest in the related radiofrequency field involve lobbying by telecom and other powerful industries, affecting both ICNIRP and its advisory bodies (Buchner et al., 2021; Hardell et al., 2021). A 2020 report commissioned by two European Parliament Members criticises ICNIRP for lacking objectivity and scientific credibility, stating its conclusions on cancer risks are incorrect and contradicted by substantial scientific evidence. The report also claims that the 2020 ICNIRP guidelines permit exposure to harmful levels of radiofrequency radiation.

The ICNIRP 2020 guidelines are criticised as inadequate for protecting public health, with calls for their immediate replacement by guidelines developed by independent scientists (Buchner et al., 2021). Supporting this concern, the EU Council's recommended safe exposure limits for EMFs are significantly lower than ICNIRP's (WHO, 2007), reinforcing the argument that ICNIRP's standards are insufficient and not fit for purpose.

Public concern about health risks from EMF exposure is high, supporting the use of the Precautionary Principle in planning (Lofstedt, 2003; Santillo 1998). — especially to protect children from potential long-term effects (Moon, 2020). This principle involves acting if

there is uncertainty, shifting the burden of proof to those proposing the activity, increasingly involving the public, and considering a wide range of safer alternatives (Kriebel,2001).

Despite these key scientific recommendations, SSEN has chosen not to adopt this approach.

The mental health effects of the industrialisation of natural spaces are significant (Bowler, 2010; Peen 2010). People in the Northeast of Scotland, along the Kintore-Tealing line are already struggling to sell their homes, as the pylon threat drops house prices. Within these communities this is affecting mental health. SSEN were challenged to produce an independent assessment on mental health impacts, which they refused to do (Freedom of information request 13.04.2024, SSEN reply 10.05.2024). Livelihoods are threatened, for example farms and holiday rentals. The perception of the risk ahead is high. This harm is unnecessary. Wales, Denmark, the Netherlands and Germany have minimised these risks, protecting both countryside and citizens with undergrounding/ subsea options (Navrud et al, 2008; Paskal et al, 2009).

With Regard to Electromagnetic Fields (EMF) and Residential Proximity and recent Evidence-Based literature.

The proposed 400 kV double-circuit overhead transmission line (AS4 / ASTI SSE400 design) is expected to operate at up to approximately 5,000 A per circuit. Based on established engineering modelling for this configuration, magnetic field strength directly beneath the line may reach approximately 90 µT under worst-case loading conditions, reducing rapidly with distance.

Using this geometry, magnetic field levels associated with epidemiological research are estimated to occur at the following approximate distances from the centreline:

- ~0.4 µT at approximately 120–150 metres
- ~0.1 µT at approximately 200–250 metres

These values correspond directly to exposure ranges that have been widely studied in relation to potential health effects.

A recent Italian case-control study (Malagoli 2023) found that children living within 100 metres of high-voltage power lines had approximately double the odds of developing childhood leukaemia compared to those living beyond 400 metres (OR 2.0, 95% CI 0.8–5.0). The study further reported that the increased risk was concentrated at distances below approximately 100–150 metres, with no clear association beyond this range.

This finding is consistent with the broader epidemiological literature. A comprehensive review by (Carpenter 2019) concludes that multiple pooled and meta-analyses demonstrate elevated risks of childhood leukaemia at long-term exposure levels above approximately 0.3–0.4 µT, with typical odds ratios in the range of 1.5–2.0. The review also notes that

magnetic field strength from power lines declines to near-background levels over distances of approximately 300 metres.

At the same time, the European Commission's Scientific Committee on Health, Environmental and Emerging Risks (SCHEER, 2024) provides an important contextual assessment of the overall evidence base. SCHEER concludes that epidemiological studies show **consistent but moderate associations** between ELF magnetic field exposure and childhood leukaemia, but that the overall weight of evidence remains **weak to moderate**, with no established causal mechanism and insufficient evidence to define a clear dose–response relationship.

This position highlights a key point: while causation has not been proven, the association has been observed repeatedly across studies, and scientific uncertainty remains. SCHEER also emphasises the need for further research and improved understanding of biological mechanisms, indicating that the issue is not resolved.

In parallel, an international appeal signed by scientists and addressed to the United Nations (UN Appeals 2015 & 2024)states that numerous peer-reviewed studies report biological and health effects from electromagnetic fields at levels below existing guidelines, and calls for stronger protective measures, particularly for children and long-term exposures.

Importantly, all of these findings relate to exposure levels far below current UK public exposure limits, which are based on preventing short-term biological effects rather than addressing long-term epidemiological observations. Compliance with these limits therefore does not resolve the uncertainty identified in the scientific literature.

Taken together, the evidence identifies a clear gradient of potential concern:

- Within ~100–120 metres: zone of strongest observed epidemiological association
- Between ~120–250 metres: exposure range corresponding to 0.1–0.4 µT, where multiple studies have reported elevated risk
- Beyond ~250 metres: magnetic field levels approach background and epidemiological evidence does not indicate consistent associations

The scientific evidence therefore presents a consistent picture of **uncertainty combined with credible signals of risk at low exposure levels**, particularly for long-term residential exposure and for children.

In this context, a precautionary approach is justified. This is consistent with policies adopted in several European countries, which seek to minimise long-term exposure well below regulatory limits. Siting decisions for high-voltage transmission infrastructure should therefore aim to avoid or minimise residential exposure within the range of approximately 0.1–0.4 µT wherever reasonably practicable.

Such an approach represents a proportionate and evidence-based response to scientific uncertainty in the protection of public health.

EMF Study Inaccuracy:
Independent review of SSEN's *Electric and Magnetic Field Study Report (SSEN August 2025)* appears to show internal inconsistencies and likely errors. Although the report states calculations were undertaken for the new Tealing-Kintore (TKUP) 400 kV line using 5,000 Amps (A) current and AS4 tower geometry, Appendix B appears to reproduce data from the separate Beauly–Blackhillock reconductoring project, which used 4,570 A and older D10 towers. This discrepancy appears to understate magnetic field strengths by around 9 % and misrepresents the design configuration of the new line.

This inconsistency seriously undermines confidence in SSEN's EMF submitted compliance evidence and overall competence in safely designing the proposed most powerful Scottish overhead transmission line ever contemplated.

In addition, there are concerns about the reliability of the applicant's evidence base more generally. The September 2024 scoping document chapter 12.4.3. refers to the NIHP CRCE (National Institute of Health Protection/Centre for Radiation, Chemical & Environmental hazards) as if it were still responsible for reviewing EMF health evidence and advising government. That organisation ceased to exist in 2021, having been wholly replaced by the UK Health Security Agency. (UKHSA)

Thus the applicant is relying on information that is already several years out of date. This **further** undermines confidence in the credibility and robustness of the assessment.

Summary:

We oppose the TKUP overhead line (OHL) due to well-documented health risks supported by decades of research—risks that could be avoided using modern underground or subsea alternatives.

Independent review of SSEN's *EMF Study Report* (Aug 2025) found apparent internal inconsistencies. This discrepancy undermines confidence in SSEN's EMF compliance evidence and overall technical competence.

Pylons are outdated technology, and peer-reviewed research associates exposure to EMFs with higher risks of cancer and other serious diseases. Critics argue that ICNIRP guidelines are inadequate, as they overlook long-term, low-intensity exposure and fail to ensure public health protection.

The Precautionary Principle should be applied, with alternative technologies explored as done in other European countries. No residential property should be within 250 metres of this proposed overhead line.

Non-Compliance with EIA Regulations. The Electricity Works (EIA)(S) (S) Regulations 2017) These require that the EIA report identify, describe, and assess the likely significant effects of the development on **population and human health**.

Health impacts have been scoped out of the TKUP Environmental Impact Assessment (EIA). As a result, the planning authority and Scottish Ministers are **not in possession of all relevant information** necessary for a lawful determination.

Health impacts should not have been excluded from the Environmental Impact Assessment (EIA) by SSEN and this accepted by the Scottish Government.

IAIN STIRLING for NOTKUP

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