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BOX 23 | CRYSTAL BAY, MN, USA | 55323

March 12, 2024

The Honorable Bruce Anderson
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St. Paul, MN 55155
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The Honorable Jim Carlson
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RE: SF 4718 – Providing for regulation of battery-charged security fences

Dear Senators Anderson and Carlson,

I am writing today to provide information on the safety and efficacy of battery-charged security fences as described in HF 3634. Briefly, I am an Adjunct Professor of Biomedical Engineering at the University of Minnesota and Professor (emeritus) at Cal Poly at San Luis Obispo. My CV is attached.

Battery-charged security fences, that satisfy US and International regulations, are safe for human beings. These regulations have developed from over 100 years of experience and scientific testing.^{1,2} The pulses are extremely short and thus the brief, high current does not affect the heart. The best analogy is to a strong static shock which can be painful but has never injured anyone. Strong static shocks can damage electronics — which responds almost instantly — but the human body is not harmed by such brief shocks. A strong static shock can have a peak current of 30 A (amperes) but is too short to be dangerous.³ Note that this is over 2x (twice) the peak current of battery-powered security fence.^{4,5} The peak current is irrelevant to safety for short shocks.⁶

A common concern is expressed about the safety of children and animals if they encounter this security technology. The US and International Electric Fence Safety Standards assume a worst-case scenario of a barefoot child contacting the fence while standing on wet ground.^{7,8} The same is true for wildlife.⁹ For technical reasons, people with pacemakers and heart disease are not at risk either. The cardiology literature warns of various dangers for pacemaker patients; the electric fence is not included as a danger.¹⁰

Respectfully Submitted



Mark Kroll, Ph.D. FACC, FHRS

¹ Dalziel CF. Electric fences-their hazards, types, regulations, and safe application. Trans Am Inst of Elec Eng. 1950;69(1):8-15.

² Whittaker. Electric shock as it pertains to the electric fence. Underwriter's Laboratories Bulletin of Research. 1939;14:1-56.

³ Intern Electrotech Comm. Electromagnetic compatibility (EMC) - Part 4-2: Electrostatic discharge immunity test. Vol IEC 61000-4-2.

⁴ Kroll M, Perkins P, Pratt H, et al. Safety of a High-Efficiency Elect Fence Energizer. IEEE Eng Med Biol Soc. 2020;41: 5016-5020

⁵ Kroll MW, Perkins PE, Panescu D. Elect fence standards with human data and AC limits. IEEE Eng Med Biol Soc. 2015;2015:1343-1348.

⁶ Kroll MW, Panescu D, Hirtler R, Koch M, Andrews CJ. Dosimetry for Ventricular Fibrillation Risk with Short Electrical Pulses: History and Future. Conf Proc IEEE Eng Med Biol Soc. 2019;41:1788-1794.

⁷ IEC. Household and similar electrical appliances – Safety – IEC 60335-2-76: Part. requirements for electric fence energizers. 2006.

⁸ Underwriters Laboratories. UL 69: Electric fence controllers. 2003.

⁹ McAtee W. The electric fence in wildlife management. The Journal of Wildlife Management. 1939;3(1):1-13.

¹⁰ Santini L, Forleo GB, Santini M. Implantable devices in the electromagnetic environment. Journal of Arrhythmia. 2013;29(6):325-333.