

**Subcommittee on National Security**  
**Subcommittee on the Interior of the House Committee**  
**On Oversight and Government Reform**  
**Hearing on:**  
**"The Threat: The State of Preparedness Against the**  
**Threat of an Electromagnetic Pulse (EMP) Event"**  
**May 13, 2015**

Good Afternoon, my name is Michael Caruso; I am Director of Government & Specialty Business Development for ETS-Lindgren Inc. ETS-Lindgren Inc. is the leading company that engineers and provides systems and components for the detection, measurement and management of electromagnetic, magnetic, and acoustic energy. Our roots date back to 1932 and we are globally recognized for our abilities to adapt new technologies and apply proven engineering principles in support of advanced technology projects.

I would like to thank Chairman DeSantis, Chairman Lummis, The Ranking Members and the Committee Members for this opportunity to testify at this hearing on EMP. I consider it an honor and a privilege to be here. I am here to share my 32 years of knowledge, experience and thoughts about the practical side of creating EMP protected environments.

For many years the U.S. Government and Military have addressed EMP protection for facilities and equipment that have been determined to be critical for National Defense. EMP hardening has been regarded as a very expensive and somewhat elusive art known to few. The current guidance document regarding EMP Protection is MIL-STD-188/125-1, Department of Defense Interface Facilities Performing Critical Time Urgent (Part 1 - Fixed C<sup>4</sup>I Facilities) (17 July 1998). There are aspects of this specification, such as an all welded steel enclosure, that are overly restrictive and excessively costly for Critical Infrastructure non- C<sup>4</sup>I applications.

In 2008, the EMP Commission, examined the evolving threat of EMP attacks on the United States and released a Critical National Infrastructures Report. The Report notes that government, public and private critical facilities and services are becoming increasingly interdependent. In addition to interdependency, those critical facilities and services are dependent on an increasingly vulnerable electrical power system. To date, little has been done to harden any of the 16 Critical Infrastructure Segments as designated by the Department of Homeland Security.

Eighteen states have ongoing initiatives to require electric utilities to address the protection of the electrical grid from the dangers of an EMP or a solar storm. Electromagnetic energy from an EMP can disrupt Supervisory Control and Data Acquisition (SCADA) systems on which the electrical grid relies. The States currently taking a proactive stand are: Alaska, Arizona, Florida, Kentucky, Maine, New Hampshire, New York, North Carolina, Colorado, Indiana, Louisiana, New Mexico Oklahoma, South Carolina, Texas, Utah, Virginia and Washington. I have recently testified at the Texas State House in support of Bills introduced by State Representative Tan Parker, State Representative Tony Tinderholt and State Senator Bob Hall. Texas is aggressively pursuing passage of EMP Legislation including a State appropriation to get Critical Infrastructure Segments started in the evaluation process.

To my knowledge, there are only three Electric Utilities in the U.S. that have taken steps in hardening their Operational Control Centers and Substation Control Buildings. I am prohibited by non-disclosure agreements, from directly identifying their names or locations. However, I can discuss the hardening process and costs of a recently completed facility.

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In 2014, ETS-Lindgren was part of a multi-disciplinary team that successfully completed construction of the first large, private-sector SCADA facility in the United States that includes EMP protection.

The building is a new-construction, 2-Story 105,000 square foot concrete tilt-up building with:

- 44,000 square feet of EMP protected space
- Emergency generators and cooling systems protected
- Approximately 40 to 60 occupants in the protected space
- Approximately \$50MM building construction cost (building only)
- Total project cost approximately \$100MM (including equipment)
- Approximate EMP Protection cost \$8MM (including additional subcontract costs)
- EMP protection was 1-year on-site (concurrent with general construction)
- Average additional "total project costs" of 8% (\$182.00/sqft)
- 2 million homes and businesses served
- 5,000 square-mile service area
- Less than \$1.00 per year per customer (spread over 5-years)
- Performance certified by Little Mountain Test Facility (U.S. Air Force, Hill AFB)

While the optimum scenario is to include EMP protection in a new building, retrofitting existing buildings for EMP protection is somewhat more complicated and costly, but certainly achievable. I recently led a five-man team in an evaluation of two control centers (primary and back-up) for an electric utility in a major U.S. City. I am prohibited, by non-disclosure agreements, from directly identifying their names or locations.

As you might imagine, existing facilities have legacy equipment and systems that were never intended to be EMP protected. This condition makes these facilities tremendously vulnerable to EMP. The existing interconnecting wiring, conduits and mechanical systems provide excellent pathways to conduct the EMP directly to the critical equipment. Therefore, a comprehensive evaluation of the facility must first be conducted to identify the "must have" functionality and equipment in the case of an EMP event. As an example, in this case, it was determined that the large system display board did not have to remain operational because the individual operators would be able to see their sector status on their individual monitors. Therefore it was only necessary to address the protection of the individual stations and a cost savings could be realized. The most critical equipment must be grouped and isolated in individual interconnected enclosures to accommodate functionality. In addition, the existing back-up power systems, cooling systems and communication systems that support the critical equipment must be protected. In some cases this will involve creating new dedicated support systems due to the complexity of the existing systems.

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The estimated Rough Order of Magnitude (ROM) costs for retrofitting an existing facility of a similar size as the previously discussed new-building is:

- 44,000 square feet of EMP protected space
- Emergency generators and cooling systems protected
- Approximately 40 to 60 occupants in the protected space
- Approximately \$10MM building construction cost (building only)
- Total project cost approximately \$26MM (including equipment)
- Approximate EMP Protection cost \$16MM (including additional subcontract costs)
- EMP protection 18 to 24 months on-site (concurrent with general construction)
- Average additional "total project costs" (\$364.00/sqft)
- 2 million homes and businesses served
- 5,000 square-mile service area
- Less than \$2.00 per year per customer (spread over 5-years)

While, in my opinion, EMP protection of electric utilities is the primary concern, due to the survival dependency we have on electrical power, all other segments of our nation's critical infrastructure must be addressed. Some proactive forward thinking electric utilities have either instituted EMP protection programs or have at least begun to consider implementing protection. However, critical infrastructure segments such as; financial, waste water, drinking water, transportation, food distribution, healthcare and emergency services have not.

It is my sincere belief that we, as a nation will someday, in the not too distant future, face an EMP attack. I have lectured and given workshops in both South Korea and Israel where they are certain that they will face an EMP attack and they are taking very active steps towards protection. I urge you to consider and pass legislation to address the EMP threat that I believe has been overlooked for far too long.

Chairman DeSantis, Chairman Lummis, Ranking Members and Committee Members I thank you again for this opportunity to present my thoughts and I would be very happy to answer any questions you might have of me.

Thank you for your time,



Michael A. Caruso