



**Testimony of Randall K. White, Chief Executive Officer of Jaxon Engineering and Maintenance, Inc. before the House Transportation and Energy Committee of the Colorado State Legislature in Support of House Bill 15-1363**

**Handout 1** - Good afternoon, everyone. For the record my name is Randy White and I am the CEO of Jaxon Engineering and Maintenance which is a Woman Owned Small Business located in Colorado Springs. We specialize in hardening or refurbishing nuclear survivable facilities for the US Government around the world. Hardening systems to survive nuclear-induced EMP (electromagnetic pulse) environments is a key component of our day to day activity. Most of our work to date has been classified either Secret or Top Secret depending on the customer and the issues at hand. That's why the work that our people accomplish each year never makes the news.

**Handout 2** - Although we are only five years old, here is a quick illustration of just some of the locations where we have been deployed to either design a solution, fix, build, or test an EMP hardened facility. Most of these facilities operate 24/7, and are related to either missile warning or command, control and or communications for national defense and security.

In all cases the government has required us and others to provide each these sites (and several others not shown) with their own stand alone, backup, but EMP survivable power systems: just in case local utilities are damaged or not available by hostile man-made actions. We call this source of EMP survivable, backup electricity "Clean" power.

**Handout 3** - Representative Ginal asked a very pointed question a month or so ago, by asking a group of us if this was an important enough issue to move forward with this Bill. The answer is "Absolutely". My calculations show that nearly 8 million Colorado residents and their relatives from surrounding states could be impacted (saved) by the action before this committee today.

On the national level, the Department of Defense has been hardening mission critical government assets to be EMP hardened and survivable for nearly 30 years. This means that the technology has already been developed, it has been tested, and proven to be successful and viable. Recently, the emphasis has switched to EMP primarily due to the very large return on investment that an adversary has over our country with just one weapon. This is an old chart. It's been used to communicate how a detonation of just one nuclear weapon at various altitudes above the United States could paint our entire surface area with severely damaging levels of EM fields and currents. That threat is still viable, but there is yet another form of EMP delivered from a small weapon detonated at ground level which might be more in line with current to world events.

**Time Permitting Material** - If that one weapon were detonated (above my fathers farm in Kansas) then all electronics in the US will be exposed to three very powerful levels of EM threats. The first (E1 or early time) happens at the speed of light and would be a spike of 70-80 thousand volts per meter, but its dwell time is roughly 10 nanoseconds. The 2nd time phase of hostile energy (E2) is a spike of 800V down to 8 volts. This is smaller in magnitude but it has a longer dwell time on the electronics than E1. E2 looks a lot like the signature of a lightning bolt. The late time phase is what is called the E3 signal. E3 has a much lower Volt/meter level, but it travels on long lines for a very long distance and can dwell up to minutes upon electronics. E3 looks very similar to Solar flares and Geomagnetic Induced Currents (GIC) and causes the same problems to the power grid. E1 and E2 are essentially the high energy, fast kills to electronics across the exposed surface area. E3 is the bulldozer of the three that first saturates, and then overheats large items such as transformers and substations.



What concerns me personally, is that there is a fourth form of EMP that is not described on this chart. Source Region EMP is created by a much smaller bomb, when that bomb is detonated at ground level. There will still be radius of 10-20 miles of E1 and E2 environments, but any copper line that touches the fireball of a nuclear detonation will then conduct E3 level environments over those long lines possibly for 100's of miles. A small bomb on the ground could be the scenario that we could see developing around the world and the US at this time.

**Handout 4** - What none of us should forget is that the most important part of today's EMP threat is really the human element, not the electronic concerns. Participants from the EMP Commission estimated that 90% of the US population could die as a result of an EMP attack upon America within one year. I personally do not believe that level of lethality applies to us here in Colorado. We have camping gear, we know how to fish, we are independent and tough. But, this statistic was skewed by urban areas, and the front range falls into that category.

Losing power in an urban area (such as here in Denver today) would be devastating. It's not just losing lights, but heat, water, natural gas, your accessibility to the bank and your finances. I have friends who say that they will just go the mountains. That's fine unless its December. Other friends tell me that they will just raise their own food in the garden. That's fine also, as long as they remember that it takes 83-90 days to grow and harvest vegetables here in Colorado.

My personal vulnerability is ... my credit card. With this Joni and I buy our breakfast, our lunch, and our dinner most days. With this we buy our gasoline for the cars, and food at King Soopers - and essentially everything else we need to support life. But, if there are no scanners or card readers, then the only money that all of us might have from this day forward is what we happen to have our wallets (or stashed away at home) ... for how long? That just might depend on what happens today.

**The critical take away from this discussion is that "Too late is truly too late"**. It's human nature to assume that there will be people out and about fixing things, like they do after a storm. In Colorado Springs the Utility Company has little white trucks which they deploy to repair power lines, etc.. I expect that the white trucks will not be showing up after a few weeks or months have gone by and the employees have not been paid, or have moved away. In either case, once the power goes away and we lose the logistics support for our commerce and culture, then rebuilding it will be a daunting and monumental process for years to come.

**Handout 5** - So, what we have to do right now is to "Fix it". I recommend that we do NOT try to harden everything due to the urgency of the threat and the short time we have right now to address this issue. I further recommend that our initial Study (the Design Charrette) should include what can be done for the ancillary systems such as fresh water, sewer, natural gas, banking, etc. to fully grasp what can be done now, vs. what can be done later. **Another critical take away from this discussion is that designing, developing solutions, and then installing fixes or treatments that will enhance our Grid's resiliency will take years to complete by skilled teams.** Therefore, we must get started as soon as possible.

Those people, teams, and the logistics support they will need all exist right now. We cannot assume that any of these factors will be there in the future after an event happens. The US government has already developed most of the technology needed for us apply it to our Grid and ancillary systems. This Bill is essential to getting our Grid hardening processes started now.

[Time Allotted for Speakers in Support of the Bill: 5 Minutes]