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SENATE JUDICIARY COMMITTEE

SUBCOMMITTEE ON TERRORISM AND HOMELAND SECURITY HEARING

GOVERNMENT PREPAREDNESS AND RESPONSE TO A TERRORIST ATTACK USING WEAPONS OF MASS DESTRUCTION

SENATE DIRKSON OFFICE BUILDING, ROOM 226

AUGUST 4, 2010

Mr. Chairman, Members of the Committee, thank you for the opportunity to testify today on the matter of nuclear generated electromagnetic pulse (EMP), one aspect of a broader nuclear threat to the Homeland, and the government's preparedness to respond to it.

My name is Michael Frankel and I served as the Executive Director of the EMP Commission, commencing with its authorization in the Floyd Spence National Defense Authorization Act of 2001 and culminating with its sunset and delivery of its final, classified, report to the Congressional oversight committees in February of 2009. Presently, I am a consultant for national and homeland security activities. I am a physicist by training and have spent many years developing technical expertise in nuclear weapon effects and managing WMD related programs for the Department of Defense in a career that spanned research work for the Navy, the Defense Nuclear Agency, the Defense Threat Reduction Agency, the Office of the Secretary of Defense, and private industry. What I should like to do today is briefly review some of the unclassified findings of the Commission and, in particular, update you on the response to those findings by the government.

The perspective of the EMP Commission was provided in some detail in the unclassified volume *"Critical National Infrastructures"* released by the Commission in November of 2008 and in an earlier unclassified overview: *Report of the Commission to Assess the Threat to the United States from Electromagnetic Pulse(EMP) — Volume 1: Executive Report* (*2004*). The Commission also prepared and submitted to the Congress and the Administration several classified reports addressing military, nuclear weapon, and intelligence aspects of the subject. The Commission's assessment was informed by its own testing and analysis activities as well as information from a number of Federal agencies and National Laboratories. We requested and received information from the North American Electric Reliability Corporation, the President's National Security Telecommunications Advisory Committee, the National Communications System (since absorbed by the Department of Homeland Security), the Federal Reserve Board, the Department of Homeland Security, the Department of Defense, and the Central Intelligence Agency.

An electromagnetic pulse is associated with any above the atmosphere - above about 40 kilometers height - detonation of a nuclear weapon. And that includes nuclear weapons of even “unsophisticated” designs. Since it is a geometrical line-of-sight effect, a detonation at a height of a few hundred kilometers would encompass within its line of sight essentially the entire United States, with the effect growing weaker the larger the distance from the burst point. For assessment purposes, a SCUD class missile launched from a nearby offshore location might reach a height of about 100 kilometers, sufficient to encompass within its effects footprint most of the eastern seaboard, with its great density of people and infrastructure.

Such EMP has been seen before during the U.S. and Soviet atmospheric test programs. In 1962, during the U.S. STARFISH nuclear test at an altitude of about 400 kilometers above Johnston Island, electrical systems in the Hawaiian Islands, 1400 kilometers distant, were affected, causing the failure of street lighting systems, tripping of circuit breakers, triggering burglar alarms, and damage to a telecommunications relay facility on the island of Kauai. In Soviet testing the same year they reported damage to overhead and underground buried cables at distances of 600 kilometers. They also observed surge arrestor burnout, spark-gap breakdown, blown fuses, and power supply breakdowns.

The EMP generated on the ground from such a high altitude detonation will not immediately damage a human being, indeed a person will not even feel it. But it will affect all of the electronic circuitry which surrounds and sustains him. While there is a range of effects that may be induced on any individual electronic components, ranging from minor bit flipping to permanent physical damage or even burn out, it was the Commission’s assessment that the power grid was likely to fail due to the cumulative effects of the expected damage. Grid collapse may well extend beyond the immediate area exposed to the EMP footprint as electrical effects may propagate from one region to another, as has been the regularly observed pattern of grid beak downs over the past decades. Depending on the severity of the exposure, many thousands of components many need replacement. If many large high voltage transformers, about the size of a house and no longer manufactured in this country, were permanently damaged – as has already happened to small numbers of transformers in severe solar electrical storms of the past - full recovery could take months to years. Many thousands of control systems – SCADAs – would be affected, as would be any elements connected to wires or metal structures that might gather the EMP energy and conduct it into the sensitive electronics components.

Due to the growing interdependence of all our critical infrastructures, and the ubiquitous dependence of all infrastructures on power, this will eventually affect all the elements that undergird and sustain our system of life – delivery of energy, access to financial services, water and food, etc. In the current era when the

power grid is on the cusp of technological change as we transition to a “smart grid” architecture, with its expected explosion in numbers of computerized control and monitoring systems, this unaddressed vulnerability to such electronic disruption will commensurately grow.

We should mention that it is not just ground based electronic systems that are endangered by an EMP producing detonation, but our entire low earth orbit satellite infrastructure as well. A nuclear detonation at high altitude will increase the intensity - “pump up” - the natural radiation belts already circling the earth, or create temporary new radiation belts by pumping electrons and other particles into orbit. Our orbiting satellites will encounter a much more hazardous radiation environment than they were built to withstand and will, in relatively short order, all cease to work. This too has already happened. In 1962, following the STARFISH above the atmosphere detonation, at a time when we did not really understand or anticipate the physics of such phenomena, there were reportedly about thirteen unclassified satellites in orbit. Within six months there were none. This includes Telstar, the first telecommunications satellite which, it is now agreed, was the most famous STAFISH victim. There were also a number of intelligence assets in orbit, but their fate is classified.

The EMP Commissions’ findings and recommendations were summarized in its final classified report to the Congress and in its published volumes. The nineteen findings and seventeen recommendations addressed to the Department of Defense were classified and cannot be summarized in this forum, but the reaction of the Department may be characterized as positive. In short, the Department concurred with almost all the findings and recommendations – non-concurring with recommendations which levied new reporting requirements – promulgated an action plan signed off by the Secretary, identified a pentagon office of primary responsibility for EMP matters – the ATSD (Nuclear, Chemical and Biological matters) - issued a new survivability Instruction, DOD Instruction 3150.09 for system acquisition which encompasses EMP, and POM’d funding to address the Commission identified deficiencies. Much of this positive effort redounds to the great credit of DoD management, the Office of the ATSD (Nuclear Matters), and the proactive leadership of US Strategic Command.

The Congress has taken at least one important step commensurate with its oversight responsibilities, although much more needs to be done. The House has recently passed HR 5026, the GRID Reliability and Infrastructure Defense Act, intended to decrease the vulnerability of the electric grid to terrorist attacks, cyber threats, electromagnetic pulse weapons, and geomagnetic solar storms, by authorizing the Federal Energy Regulatory Commission to take measures to address known and potential vulnerabilities.

The Commission also provided seventy five unclassified recommendations, mostly directed at the Department of Homeland Security (DHS), intended to mitigate vulnerability and increase resilience of the nation’s critical

infrastructures. Unlike the response of the DoD, there has been no detectable resonance as yet out of the DHS. While the Commission discovered a number of competent and knowledgeable individuals in the Department, particularly those who had been associated with management of the National Communications System at the time it was absorbed into the DHS, it was difficult for the Commission to find anyone at the "confirmed level" of management authority in the Department whose responsibility it was to establish policy and direction for EMP matters. As a result, the Commission's recommendations seem to have simply languished.

Along with ignoring Commission recommendations to DHS, the Commission noted a significant disconnect in the Department's planning response for nuclear terrorism. A "smuggled in" nuclear device and ground level detonation is one of the fifteen planning scenarios around which the DHS had organized its planned disaster response, which included the allocation of billions of dollars towards development of sensors that might interdict such devices at ports and other entry points. However, there has been no discernible planning that considers whether the same nuclear device might not be launched from offshore to produce an EMP, with no need to engage the dangers of detection at point of entry. While the smuggling scenario properly requires attention, once the intent to do harm with a nuclear weapon has been accepted by DHS, there seems little justification for ignoring one component of the threat.

Protection of the nation's critical infrastructures from an EMP threat is both feasible and well within the Nation's means and resources to accomplish. A number of these actions also reduce vulnerabilities to other serious threats to our infrastructures, thus giving multiple benefits. It is not feasible to reduce the consequences of an EMP attack to an acceptable level of risk by any single measure. However, in the view of the EMP Commission, it is possible to achieve an acceptable level of risk and reduced invitation to an EMP attack with a strategy that integrates several significant measures:

- Pursuing intelligence, interdiction, and deterrence to discourage EMP attack against the US and its interests;
- Protecting critical components of the infrastructure, with particular emphasis on those that, if damaged, would require long periods of time to repair or replace;
- Maintaining the capability to monitor and evaluate the condition of critical infrastructures;
- Recognizing an EMP attack and understanding how its effects differ from other forms of infrastructure disruption and damage;
- Planning to carry out a systematic recovery of critical infrastructures;
- Training, evaluating, "Red Teaming," and periodically reporting to the Congress;
- Defining the Federal Government's responsibility and authority to act;
- Recognizing the opportunities for shared benefits;

- Conducting research to better understand infrastructure system effects and developing cost-effective solutions to manage these effects.

I wish to thank the Committee for this opportunity to present my views of this most important issue