



### **Avi Schnurr's remarks - FERC Bulk Power System Reliability Conference, Feb. 8, 2011**

I would like to thank you, Chairman Jon Wellinghoff, Commissioner Cheryl LaFleur, and all the Commissioners and Commission staff for inviting me to participate in this important conference. Of all the regulatory commissions and agencies in the U.S. government, your work is unique. Everything our nation does, our lives and our welfare depend on energy reliability, and opportunities like this conference to step back and consider directions and goals are critical.

I would like to spend the few minutes I have here today discussing EMP. To begin, let me try to characterize the problem.

EMP, Electromagnetic Pulse effects come in two categories: Natural, and malicious.

In 1859 there was a massive solar flare: brilliant northern lights stretched all the way to the equator, and the telegraph network was burned out worldwide. A similar event, nearly as large, occurred again in 1921. Based on the recent National Academy of Sciences NASA-funded study, there have been severe Coronal Mass Ejections at least once per century – far worse than anything seen in modern times. In broad terms this means less than a 50% chance we will get through the next several decades without experiencing this kind of severe space weather. The study's conclusion: ground induced currents from such events will greatly exceed the design margins of the large transformers that distribute power in the grid. Many – if unprotected – will be destroyed.

In upper atmosphere tests in 1962 both the U.S. and the Soviet Union discovered a similar effect can be produced with a nuclear warhead. Radios failed and street lights went down in parts of Hawaii, more than 800 miles from a U.S. test, and similar Soviet tests over Kazakhstan caused a wide variety of failures. In the decades that followed, the Pentagon spent hundreds of billions of dollars, and EMP protection became a profession in its own right.

In the days of Mutually Assured Destruction, there was no reason to look beyond the effects on strategic weapons, but there was never any doubt of the effect of EMP on electric infrastructures. Today, unfortunately, our electric infrastructures are orders of magnitude more sensitive than at the time of those first tests, and concerns are also growing over the potential risks of non-nuclear EMP.

Where are we today? Where do we go from here?

There are always two choices for dealing with predicted crises: Prevention, and recovery.

In the political world where decisions are made, it is always easiest to wait. Once disaster strikes, it brings with it the energy and urgency to drive a massive recovery. Recovery is the easy choice.

In the real world, recovery from a major disaster is complex, agonizing, and expensive. In the real world, it is always easier not to wait. Prevention is easier.



Ladies and gentlemen, EMP is a game changer. If we don't learn to merge these two worlds, life as we know it will soon be over. We have built all the infrastructures that support our lives and our society on the same, vulnerable electric foundation. When it breaks, our lives and our society will be shattered. This time, recovery will not be possible.

The next severe space weather event, when it comes, will destroy between 300 and one thousand transformers, leaving 130 million people without power. And let me be clear: If either natural or malicious EMP destroys or disables a substantial portion of the U.S. electric grid, replacement of most of the transformers will take up to a decade, or longer. We cannot survive even weeks without the electric grid, and the food, water, medical care, communication, transportation and many other infrastructures that depend on it.

In the entire history of the United States, this situation is unprecedented. Two Congressional Commissions, the Department of Energy, the Department of Homeland Security, NASA, the National Academy of Sciences and FERC are now all predicting a disaster of breathtaking dimensions. And unless the Pentagon, the former Soviet Union and all of these U.S. government agencies got this wrong, if we do not take basic steps to protect ourselves in time, it will be the end of life as we know it.

Let me be very specific. Based on the work of six different U.S. government agencies, vulnerabilities of our electric infrastructure have made natural and malicious EMP an existential threat. Nations that prepare in advance will survive, without catastrophic destruction. Nations that do not, will not.

On a more positive note, I am happy to report the United States is no longer alone in dealing with this issue. The work done here in the U.S. is beginning to have international impact, and last year the United Kingdom made electromagnetic threats a national priority in their strategic plan. This took place in the context of a new international security framework, the Electric Infrastructure Security Summit process. More than eighteen nations came together in the U.K. Parliament in London last September, inaugurating a new framework for coordinated protection. The second meeting will be particularly critical. EIS Summit delegates will review a new international infrastructure protection roadmap when they meet in the Capitol Building here in Washington D.C. in a few months, on April 11.

I would like to finish, if I may, with a few words on the practical aspects of infrastructure protection. This process will certainly require close cooperation and consultation between government and industry, and between government stakeholders and regulators at both the federal and state levels. However, the technology needed to protect the electric grid is now well understood. Blocking devices will be needed for the ground lines of transformers. Training programs will enable utility teams to evaluate and implement other changes needed in power substations. This process will likely begin with prototyping and testing, and then move on to phased, prioritized implementation, but with all the work that has been done, we can now begin defining that process. And based on initial estimates, the costs involved should not be more than a few cents per kilowatt hour.

I said a few minutes ago that in the political world, recovery almost always trumps prevention. It is important to note, however, that this is not true in private industry, where decision makers depend on expert predictions to guide their investments, and survival and profit depend on faithfully delivering a



product. The imagination and good management traditions that have made U.S. industry a model for the world make it a powerful engine to resolve this risk. If government and industry stakeholders can work together, developing a plan that also has the confidence and buy-in of the nation's best EMP experts, we can prevent this crisis.

The escalating EMP vulnerability of our basic infrastructures evolved over many decades, and cannot be attributed to any one group or organization. But sitting here today are the people who will be among the most important in resolving this problem. It is a heavy responsibility. But if we jointly dedicate ourselves to this task, we can take a step that will build a secure world for our children and grandchildren, and a model for our friends and allies worldwide.

Thank you.

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