Electromagnetic Pulse (EMP) & EPRI EMP Project Update

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NASEO Energy Security Committee
September 13, 2016
What is EMP? And What do We Know About it?

- Intentional, man-made attack
  - **E1 – Very fast rise time**, may result in damage to electronic components either directly, or by coupling into the attached wires.
  - **E2 – Similar to lightning**, can result in damage to electronics and potential flashover of distribution class insulation.
  - **E3 – Long duration and low frequency**, similar to GMD, but EMP (E3) has two potential impacts; increased reactive power consumption and potential protection system misoperation as a result of harmonics.

- EMP can occur with little or no warning, most operational strategies are inapplicable.
High Altitude Burst Generated EMP (HEMP)

- The HEMP signal extends to the visual horizon as seen from the burst point.
- A large device detonated at 400–500 km over central USA would affect all of the continental USA.
- Effects depend on: altitude of the detonation, weapon yield, interactions with the earth’s magnetic field, and electromagnetic shielding of targets.
Intentional Electromagnetic Interference (IEMI)

- IEMI is a form of EMP
- Similar frequency content, mainly in the E1 region
- IEMI attacks do not result in E2 and E3 fields and the resulting effects
- IEMI devices (compared to EMP)
  - Smaller, more portable, less sophisticated, and less expensive
- IEMI impact (compared to EMP)
  - Deliver a geographically focused impact
  - To create a widespread impact on the grid similar to EMP, a coordinated attack in numerous locations would be necessary

Champ missile test flight knocks out electronic devices with a burst of energy (Gizmag – 2012)
Risk Management: Understanding Probability and Consequence

- Extreme
- Major
- Moderate
- Minor
- Incidental

Impact

- Rare
- Unlikely
- Possible
- Likely
- Frequent

Likelihood

- Possible
- Likely
- Frequent

- Need to understand the impact
- Need to Improve Understanding of Likelihood
- Need to Manage / Lower Impact as Appropriate

- EMP
- e.g., Class 5 Hurricane
- e.g., Rain Storms

Increasing Risk
EMP Project Plan

- Participation: 50+ members
- Collaboration: DOE, DoD, National Labs, Industry Groups

Three year Research Project
Initiated April, 2016
Together…Shaping the Future of Electricity

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