Electromagnetic Pulse (EMP) & EPRI EMP Project Update

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NASEO Energy Security Committee
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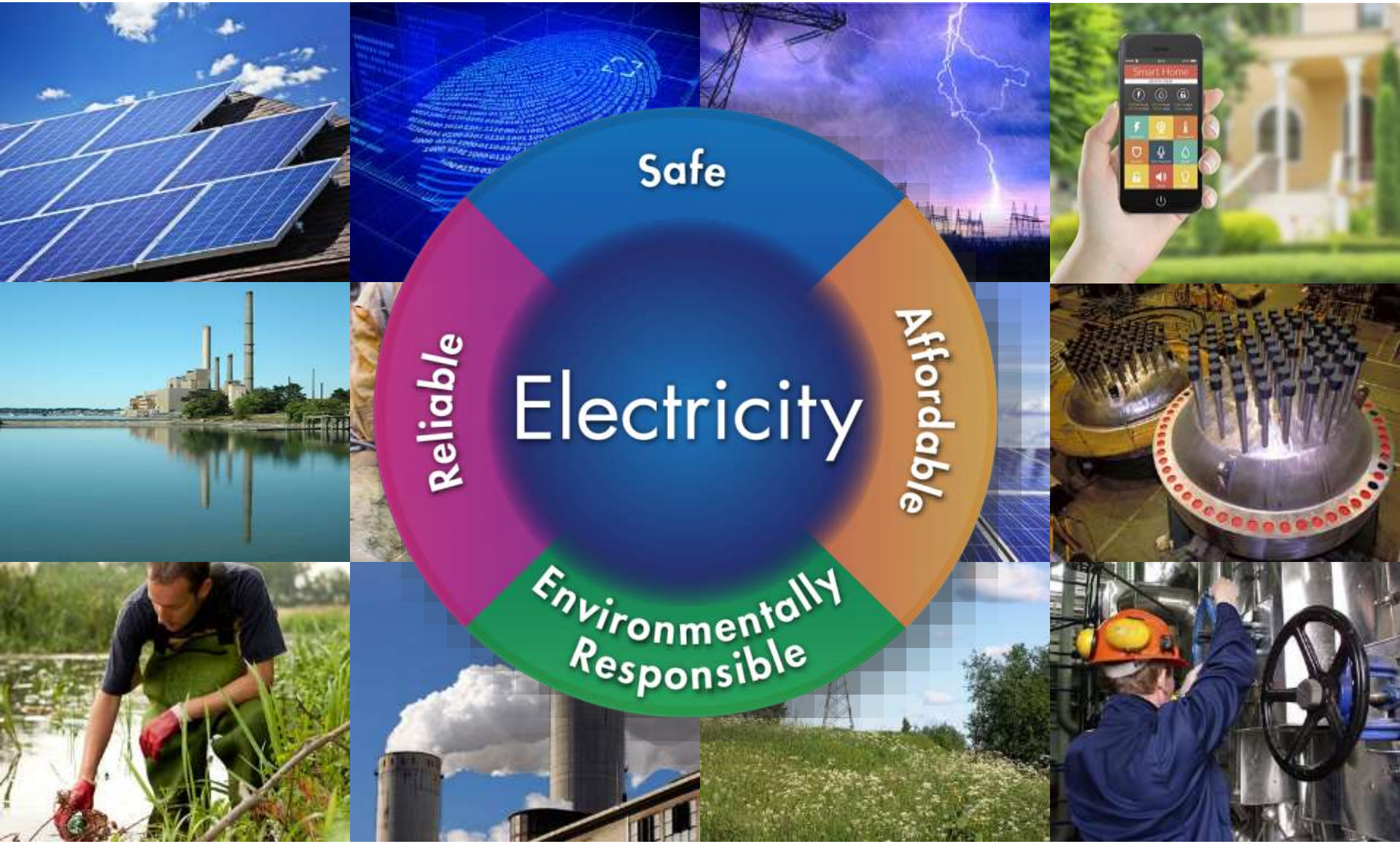
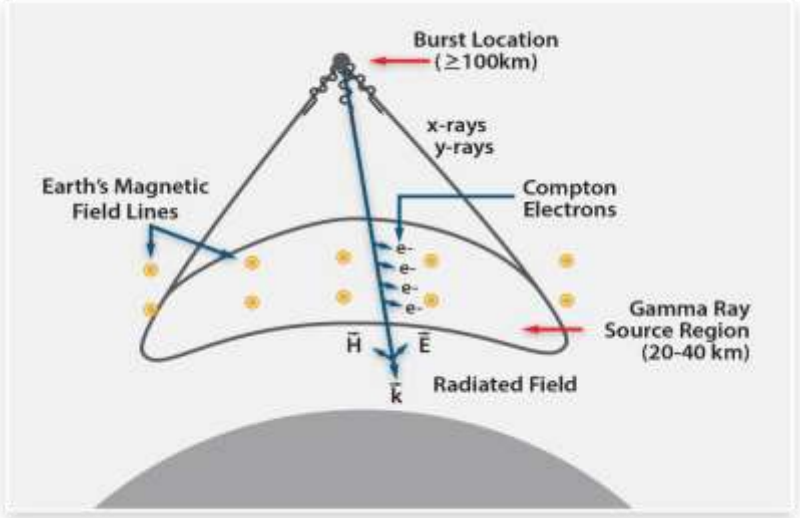
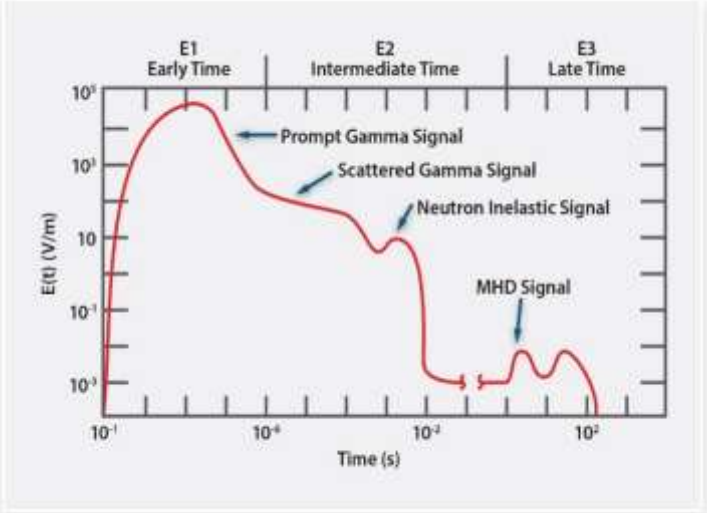


EPRI ELECTRIC POWER RESEARCH INSTITUTE

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

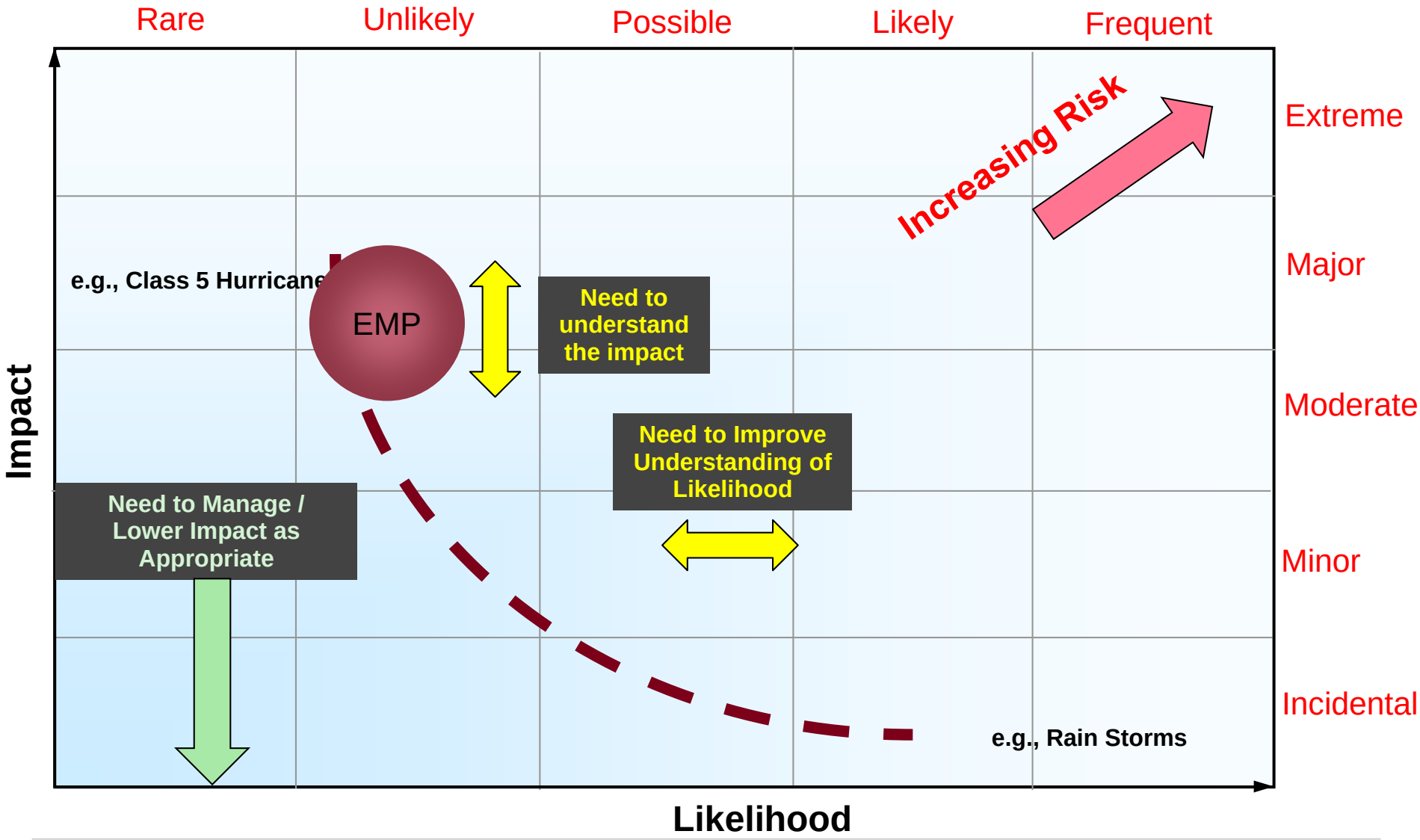
Intentional Electromagnetic Interference (IEMI)

Champ missile test flight knocks out electronic devices with a burst of energy (Gizmag – 2012)

Diehl Munitions Interference System

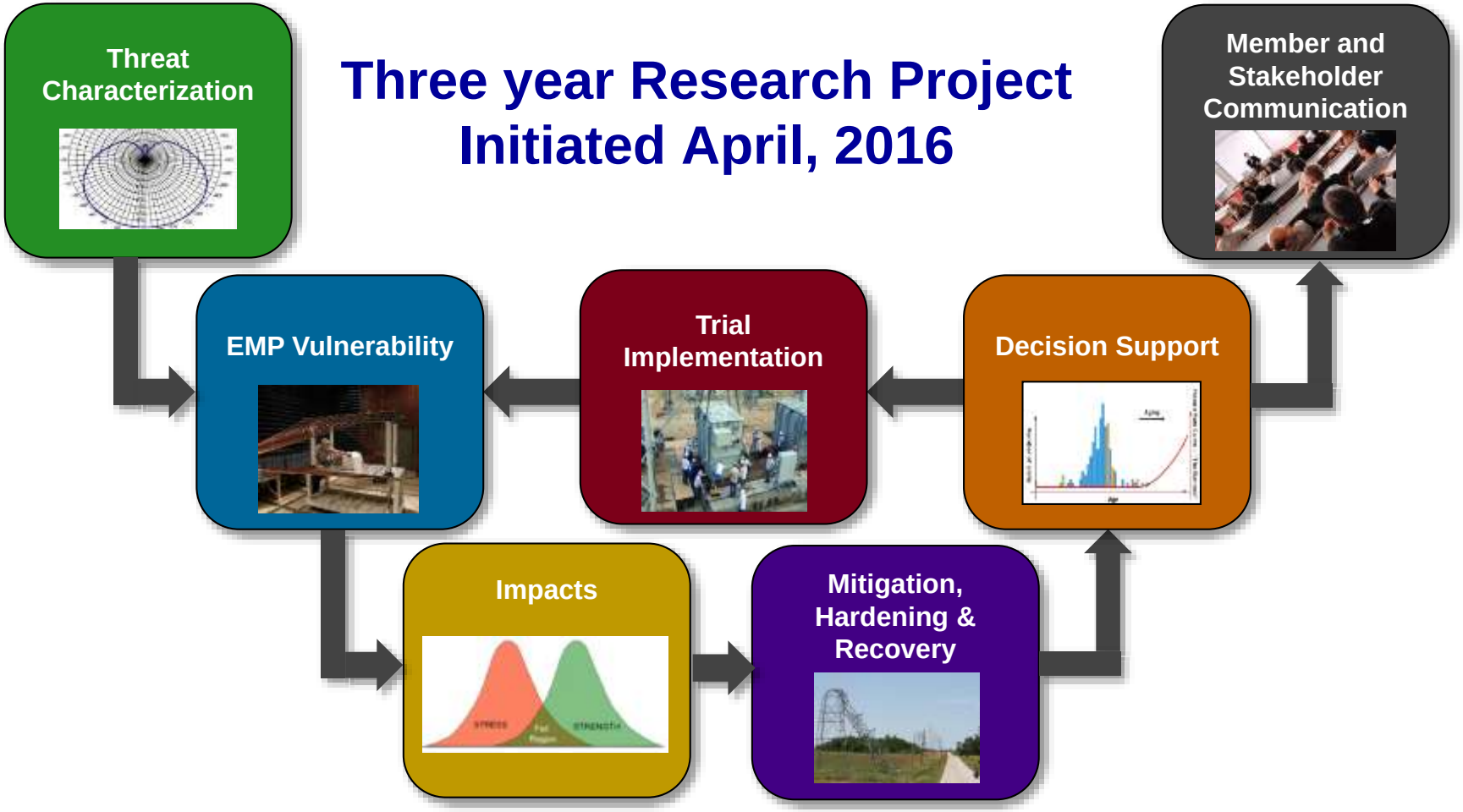
- IEMI is a form of EMP
- Similar frequency content, mainly in the E1 region
- IEMI attacks do *not* result in E2 and E3 fields and the resulting effects
- IEMI devices (compared to EMP)
  - Smaller, more portable, less sophisticated, and less expensive
- IEMI impact (compared to EMP)
  - Deliver a geographically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

Risk Management: Understanding Probability and Consequence



EMP Project Plan

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



Together…Shaping the Future of Electricity

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