ADVANCED FUSION SYSTEMS

Why should a utility invest in EMP protection?

1. EMP can come from:

    A. A high altitude nuclear explosion

    B. From an electric source

        a) A terrorist taking out a substation with a modified Marx Generator

        b) A rogue government EMP signal from a plane, ship, weather balloon, or satellite

    C. From a drone using explosive technology

2. Government studies show that a nuclear explosion in the upper atmosphere from 30 to 400 kilometers (18 to 50 miles) can take out the electrical grid for four years because of the delay in getting new transformers. In that four-year period the population would be without water, sewage, light, and fuel, therefore 70% of the people would die.

3. The loss of any transformer is expensive as both the purchase and installation costs are significant. In addition, customers would be deprived of service, and the utility would lose income while the transformer is out. Currently a 10 MVA transformer has an order backlog of 70 to 130 weeks. Large transformers can take years to replace.

4. Protecting a transformer from EMP increases the cost by less than 10%. The percentage increase is dependent on transformer size as the EMMP protection cost is nearly constant while the transformer price increases with size. Some examples are: 2 MVA transformer + 8.2%, 10 MVA +2.4%, 300 MVA +0.95%. This cost can be included in the rate base according to the regulations added after 9/11. FERC has stated that approval of EMP protection costs would be expedited.

5. Lightning strikes will sometimes trip breakers, interrupting service to customers and losing income for the utility. In tests that we have run with the EMP protection in parallel to lighting protection, breakers do not open. Because the lightning protection and EMP protection are in parallel, the EMP protection should also reduce the load on the lightning protection device and extend its useful life.

Information that indicates there is no worry about E1 exist but is incorrect

A) Lightning protection will stop E1

1. Sandia national laboratories data shows that lightning protection is too slow to be effective in protecting against E1

B) EPRI says E1 "not a great problem"

1. They only tested digital protective relays (DPS), not Transformers. Their data in the report shows that 5% of the DPS fail under mild conditions and 15% fail in harsh conditions. There is no testing of Transformers.

2. Oak Ridge national laboratories tested Transformers over a wide range of voltages and concluded that distribution Transformers are at risk if they are rated at 72 KV or lower.

C) Information on certain government facilities claim they are protected from EMP

1. The actual protections in the report show only protection at lower voltages, not medium voltage levels of distribution transformers. There is a paragraph in one report related to "EMP in a box " where they state items that cannot be protected by a Faraday cage should have a spare in a Faraday cage to replace the damaged item. As an EMP pulse can be repeated quickly, or at a later date, this does not seem adequate.