Connecting the Science to the Power System

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Our primary Objective

- Keep the lights on, particularly to never have cascading blackouts, complying with the level of probability of reliability required
- Transmission operators are required to assure we are always in a “known state” operating condition that is proven to be reliable for specified contingencies, (and there are steep sanctions for violation!)

How do we do this?

- Rigorous contingency simulations of the power system assessing it for thermal (line sag), Voltage Stability and Transient Stability
- These set limits of operation which also need to be sufficient to meet the electric power requirements.
- With the introduction of GIC on the grid we have to factor in challenges to maintain acceptable voltage and assure GIC induced heating in UHV Transformers doesn't cause failure.

What we have to have

- For our planning and operations reliability simulations, we must know the GIC for the conditions being studied on all main grid transformers including generator step-up transformers in order to:
  - Identify transformers that might be vulnerable
  - plan the power system for present and future,
  - develop reliability limits for daily operation,
  - develop real time assessment and simulation
  - longer term grid planning

We Need Help from you……

- Accurate GIC levels based on good resolution field strengths and frequency.
- Accurate earth conductivity data
- A good sense of probabilities of severities of GMDs that should be withstood
- Accurate predictions of GMD magnetic orientation and intensity hours ahead
- (and we then need to determine the impacts of GIC on our transformers in terms of reactive draw, harmonics, and heating.)

Thanks!

- The Space Weather community has been of great help to the Continental power grid

What we need

- The ability to simulate the impacts of a GMD on a planning basis that in which we:
  - Determine what probability and severity of a GMD we must harden the system to withstand e.g., a 100 year “storm (or what ever probability is adopted) be able to withstand without violating out system performance requirements
  - For that severity