

GIC at ATC

David Wojtczak

Team Leader, Substation Services
American Transmission Company

Presentation Outline

- History with GIC
- Present Activities
- Future Opportunities

History of ATC and GIC

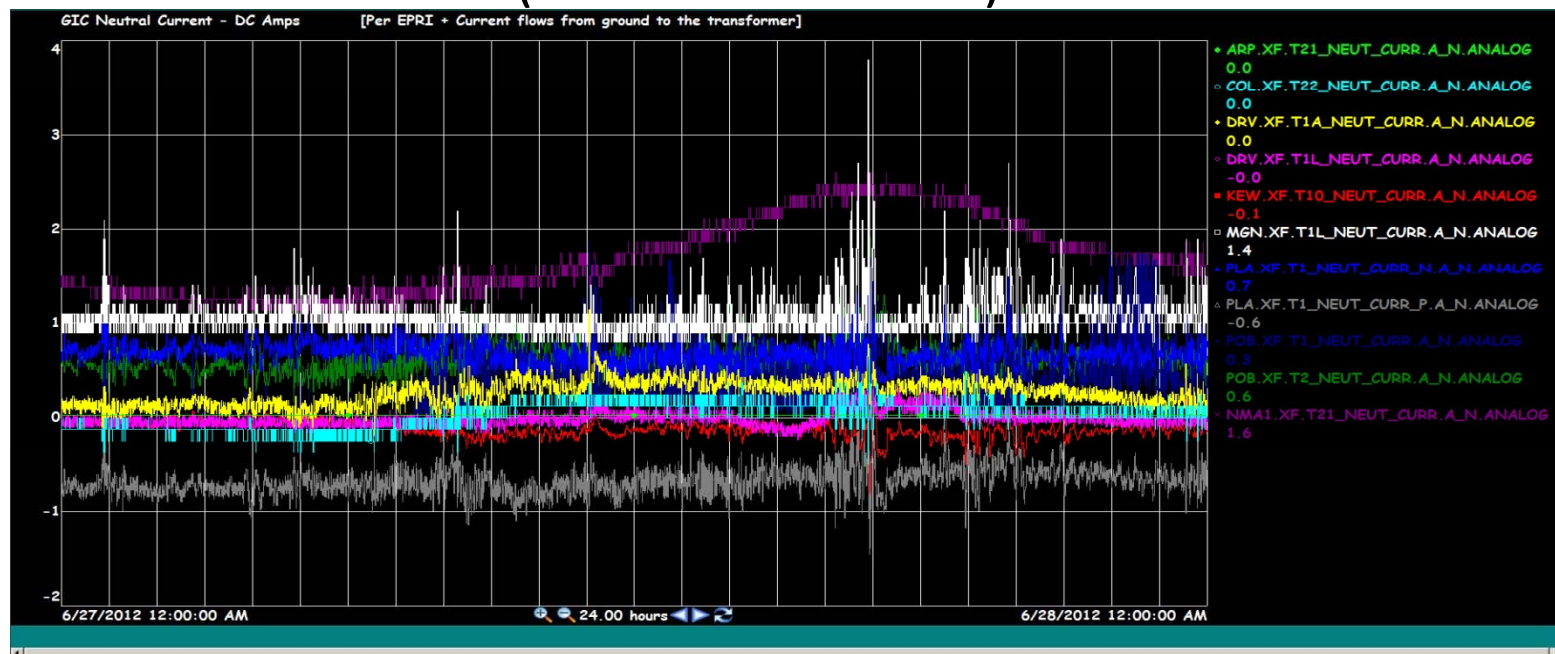
1. Monitors installed on 11 transformers
2. Participation in EPRI Sunburst
3. Operating Procedures
4. No damage to transformers or forced outages
5. Active participation in the NERC GMD Task Force

Present Activities

- ATC GMD Working Group Formed
- The Three **M**s of GIC
 - **Monitor**: Add Neutral Current Monitors
 - **Model**: Analyze ATC system for GIC effects
 - **Mitigate**: Neutral Blocking Device(s)
 - Evaluate equipment offerings
 - Possible trial installation

Neutral Current Monitoring

- DC neutral current
 - In house design
 - Low cost solution
- Send data to EPRI SUNBURST project when GIC events occur
- 23 transformers (12 added in 2012)



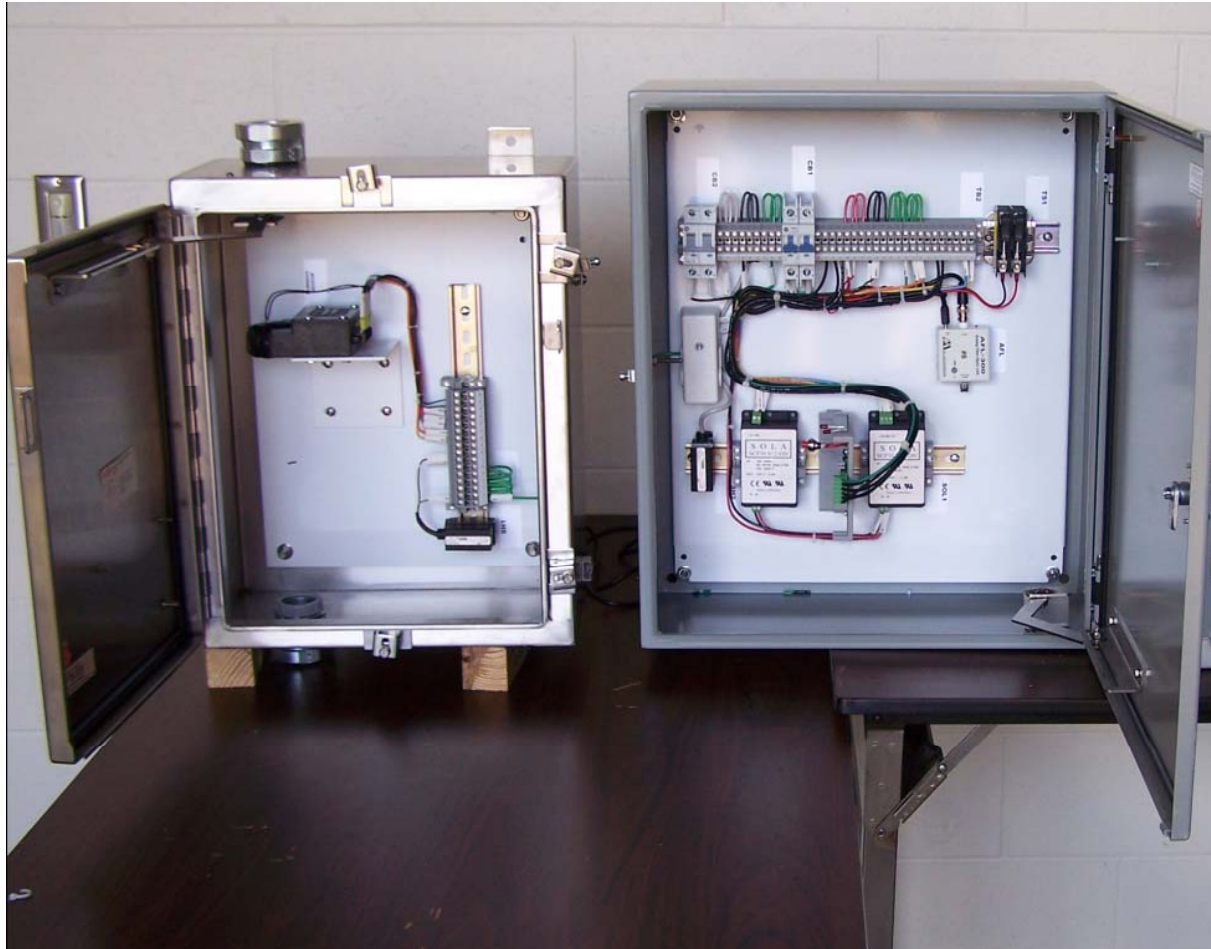
Hall Effect CT Box



Overview of Installation

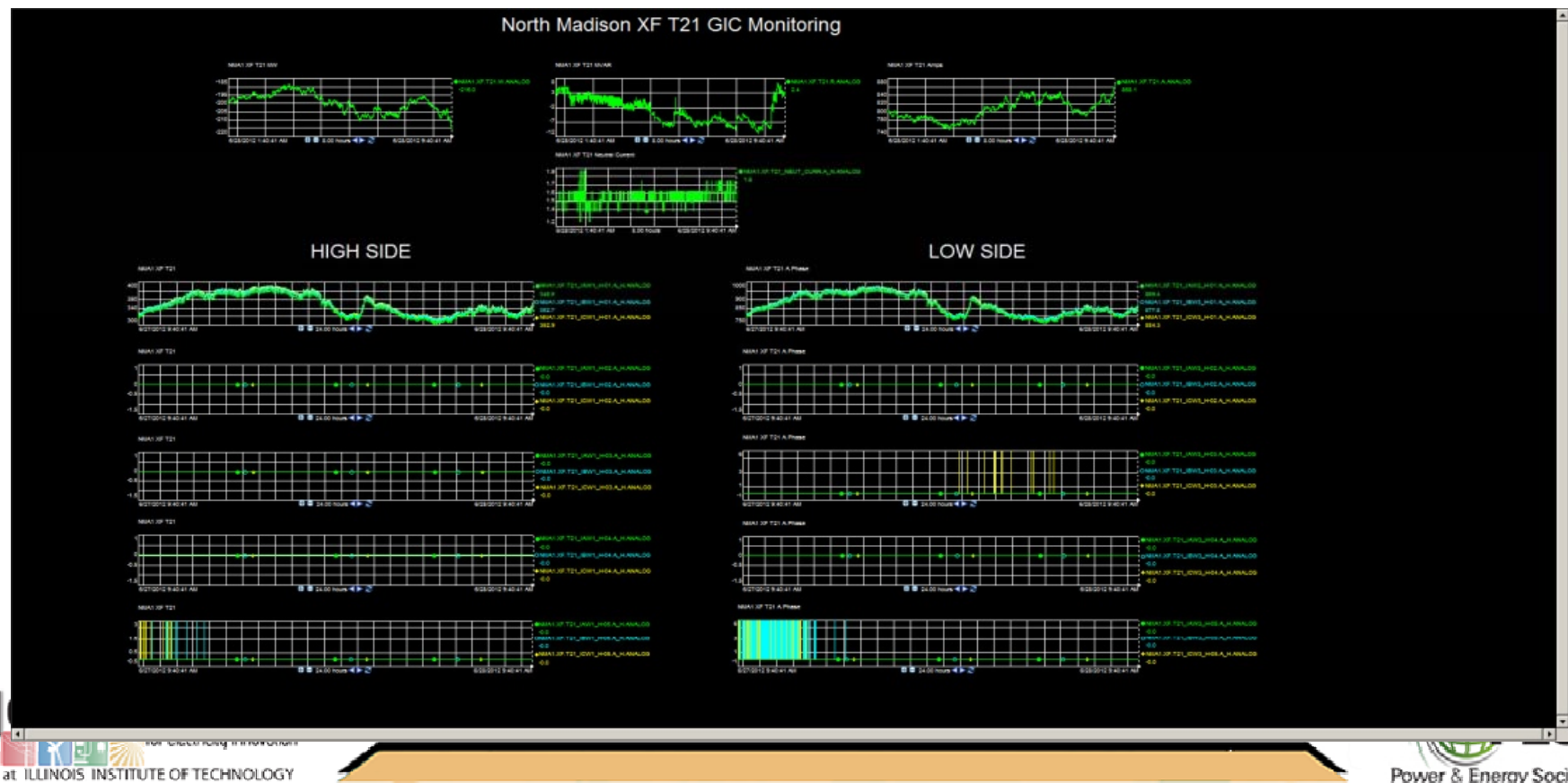


Bench Setup



GIC Harmonic Monitoring

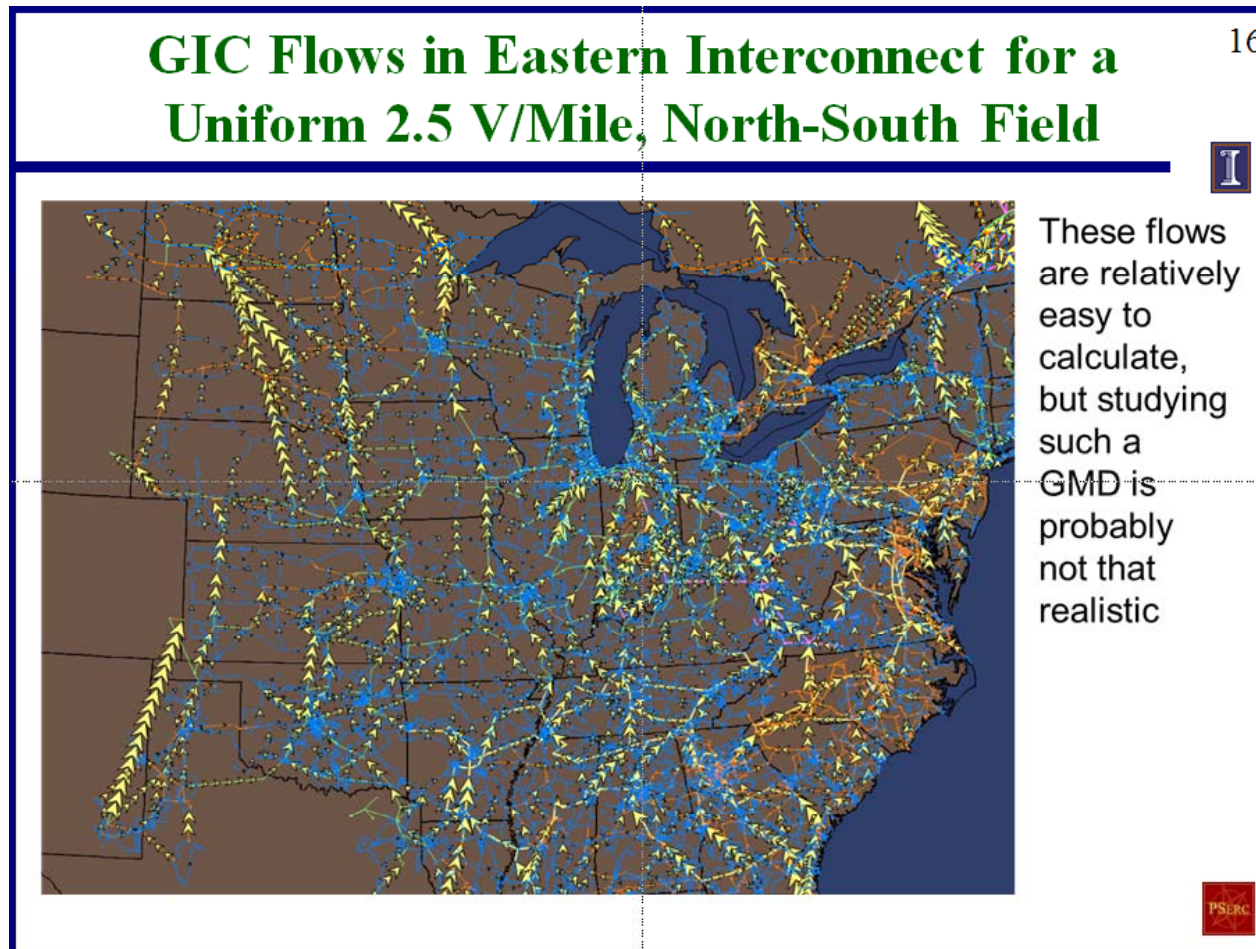
- 1st – 5th Harmonics
- Two transformers
 - GIC harmonic monitoring (associated with saturation of core)
 - Uses existing relay capabilities



Modeling Efforts

- Working with Power World to model ATC system
- EMPRIMUS sponsorship
- Data supply
 - Transformer impedances
 - DC resistances
 - Ground grid resistances
- Calibration of model with “real world” data

Modeling Graphic

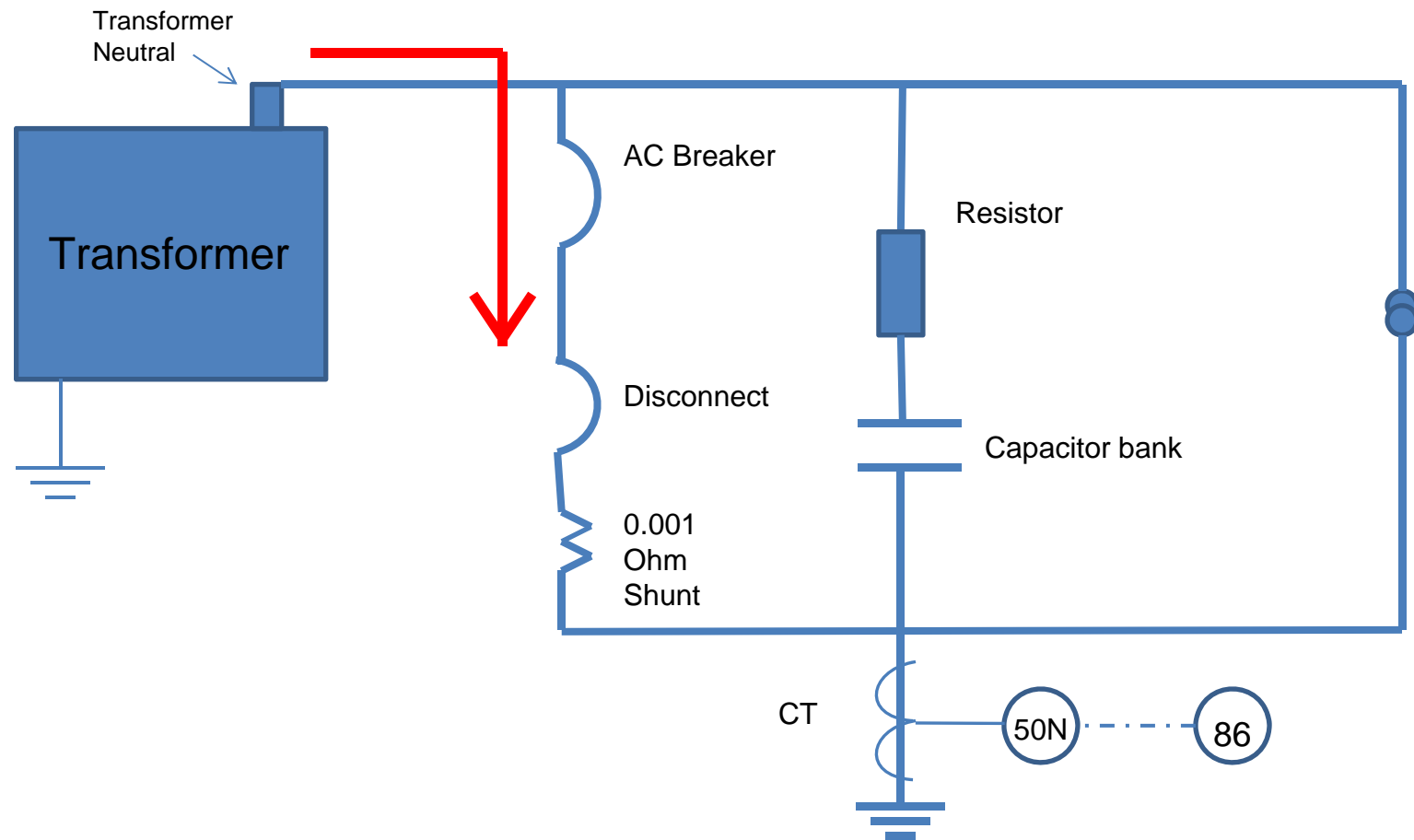


Source: Tom Overbye – University of Illinois at Urbana - Champaign

Mitigation

- Several mitigation technologies under development
- Basic design—insert impedance into the transformer neutral to ground connection
 - Capacitor
 - Resistor
- Concerns
 - Fail-safe design robustness
 - System protection implications
 - Effects on other utilities' infrastructure
 - Operational complexities
 - Retrofitting

Mitigation One-line



Future Work

- Model refinement based on comparison with field measurements
- Expansion of measurement
- System analysis and project development
- Regional approach due to nature of GICs
- Operating and maintenance history of mitigation strategies
- Continuous improvement

Questions?

David Wojtczak

262-506-6823

dwojtczak@atcllc.com