

# Secure the Future Power Grid: Smart Grid versus Smart Attacks

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## Security issues of the Smart Grid

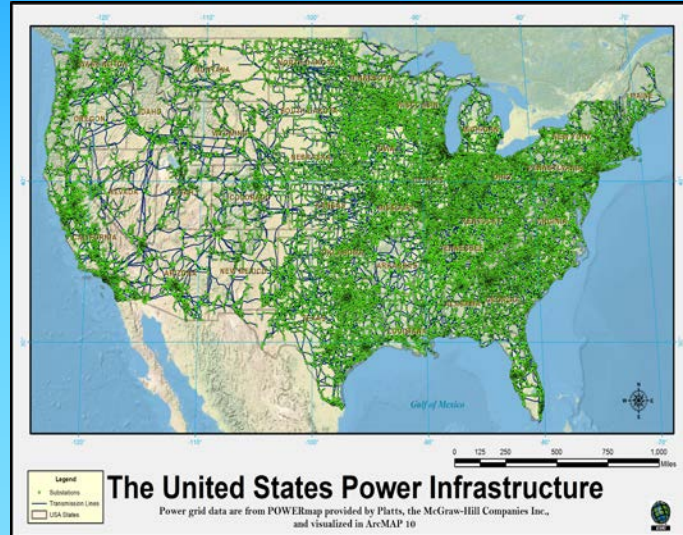
- Structural vulnerability of power grids
- Complex, dynamic power demand and supply in operations
- Interdependent network layers with critical components
- Complex cyber attack scenarios and defense strategies.

## Motivations

- Cascading failures and large-scale blackouts
  - e.g., 2003 North America & 2012 Northeast India
- Cyber penetration in Smart Grid;
- Intuitive visualization for efficient decision-making support system.

## Challenges

- Complex dynamics of grid failure behavior to model;
- Real-time request in large-scale power grid;
- Integration of electrical grid topology and intrinsic power system characteristics.



## Key innovations of our research

### From the security perspective:

- Revealing complex power grid failure behavior;
- Comprehensive, flexible and scalable models for security analysis;
- Artificial intelligent algorithms for complex attack and defense strategies.

### From the power grid perspective:

- Integration of network security with power system analysis;
- Spatio-temporal analysis with network topology;
- Power system dynamics and fault analysis;
- Visualization of power grid with GIS.

## Research methodology and contribution

- Intuitive and interaction visualization of threats against attack and failure
- Fast identification of trivial and critical attacks
- Critical timing information for defense with limited resource
- Categorization of attacks for optimal response

