Southern Company’s Schatz Grid Visualization & Analytics Center (SGVAC)

NASPI Work Group Meeting
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Outline

- Motivation
- Vision
- Benefits
- Capabilities
- Focus Areas
- Sample Projects
- Collaborative Partners
Grid-ready systems warrant real world data

**Motivation**

**TRL 7**
- Full-scale Prototype
- Relevant Conditions

**TRL 8**
- Final System
- Operating Conditions (Void)

**TRL 9**
- Final System
- In Operation
Pre-operational development, evaluation and demonstration of situational awareness technologies for Transmission & Distribution
Benefits

- Test and validate before implementation
- Evaluate technology with real-world data
- Test ‘control center of the future’ functionalities
- Quickly standup of pilot assessments
- Collaborate with industry partners
- Train control center operators
Extensible electronic firewall and switch for isolation and security
Access to real-time power delivery data from multiple sources including synchrophasors
Real-Time Digital Simulator (RTDS) with hardware-in-the-loop testing capability
Power system equipment including relays, GPS antenna, GPS clock etc.
Access to capabilities at remote research sites
Analytics and visualization tools
Monitor stations and large display screens
Focus Areas

Big Data
Analytics & AI

Cybersecurity Solutions

Control Center of the Future Functionalities

New Visualization Approaches

Research & Development

DERMS Platform Evaluation

Modeling & Simulation

Synchrophasors
Grid Situational Awareness Tool (GSAT)

**FEATURES**
- Geospatial Display
- Event Detection
- Weather
- SCADA
- Infrastructure & Asset Health
- Contouring (Voltage, Freq, Angle)
- Operating Boundaries
- Event Replay & Analysis

**Features**
- Infrastructure and Asset Health
- GIS & Weather Capable
- SA Dashboards
- Grafana compatible
Linear State Estimator Pilot

Goal: Assess feasibility to provide situational awareness of the bulk power system state, and to provide an independent monitoring platform to support system operations.
EPRI’s Synchrophasor Based Machine Learning Tool (SBML): development of machine learning techniques using synchrophasor data for event precursor analysis.
Analytics & Visualization of Substation Sensor Suite

Installed Sensors
- Arrestor Sensors
- Leakage Current Sensors
- Conductor Sensors
- Structure Motion Sensors
- AE Bushing Sensors
- RFI (Partial Discharge) Sensors
- Ballistic Impact Sensors

Expected Benefits
- Safety & Reliability
- Increased Operator Awareness
- Forensic Analysis
- Accelerate Individual RF Sensor Development
- Enable learnings from field application for analytics development
Transmission Monitoring Diagnostics & Visualization (TMDV)

**Design**

- Visualization
- Analytics
- Integration
  - EMS
  - Lines Data
  - Subs Data
  - PMUs
  - Other Sensors
  - Other Data Sources

**Function**

**Data Integration**
- Facilitate easy access to multiple sources – Automate Information Extraction
- Monitor data quality and availability

**Monitoring, Diagnostics & Visualization**
- Provide asset & system health in real-time
- Predict equipment failure & System Disturbance
- Enhance Decision Support

**Analytics for Multiple User Types**
- Farmers
- Miners
- Explorers (AI etc.)
New Visualization Approaches

Gaming Application

On-Time Flight Visualization

Solar Generation Analysis

Applications in other industries

Applications Power Industry
EPRI: Alarm Visualization and Assessment Tool (AVAT)
Real-time Digital Simulator (RTDS)

- Hardware in the loop testing
- Simulation of the Power system incorporating
  - Smart grid applications
  - Distributed generation - wind, solar, fuel cells...
  - True hard real time response for closed-loop testing
  - Protective relay testing - line, transformer, busbar, generator...
  - Control system testing - HVDC, SVC, FACTS...
DERMS Platform Evaluation

Goal: Assess capability to leverage and manage grid edge distributed devices and to enhance the performance and energy efficiency of the grid to the benefit of all customers

Edge of Network Grid Optimization (ENGO) Device

- Distributed, autonomous, fast acting devices on secondary to reduce voltage volatility
- Swarm operation with no communication between devices
- Acts on the secondary but has positive impacts on primary -> System Level Benefits!
- Improves grid efficiency (technical losses)
Grid Visualization & Analytics Center

Test bed for next-gen control center
Technology evaluation with real world data
Testing and validation before implementation
Quick standup of pilot assessments
Collaboration with industry partners
Training for Operators

Research & Development

Cybersecurity Solutions

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Control Center of the Future Functionalities

Big Data Analytics & AI

DERMS Platform Evaluation

Modeling & Simulation

Synchrophasors

Visualization
Analytics
Integration
Cybersecurity