

Research & Development

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

**NASPI Work Group Meeting
November 3, 2020**

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Principal Engineer - Research & Development
Southern Company



Motivation

Vision

Benefits

Capabilities

Focus Areas

Sample Projects

Collaborative Partners



Grid-ready systems warrant real world data

TRL 7

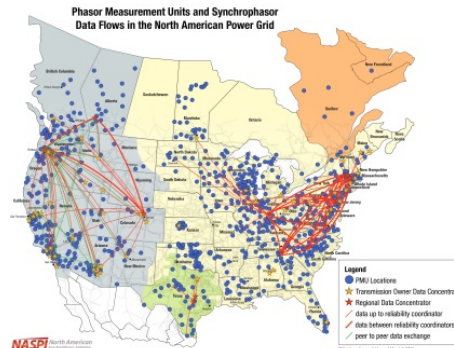
TRL 8

TRL 9

- Full-scale Prototype
- Relevant Conditions

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

- Final System
- In Operation



Pre-operational development, evaluation and demonstration of situational awareness technologies for Transmission & Distribution



Schatz Grid Visualization & Analytics Center (SGVAC) Research & Development



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.

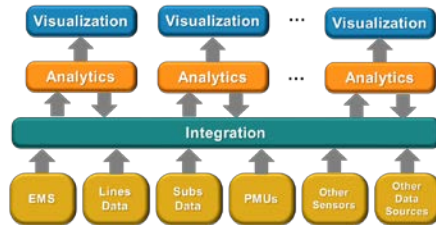
Access to capabilities at remote research sites

Analytics and visualization tools

Monitor stations and large display screens

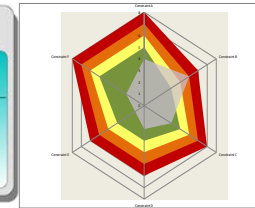
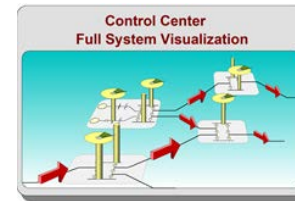


Big Data Analytics & AI



Cybersecurity Solutions

Control Center of the Future Functionalities



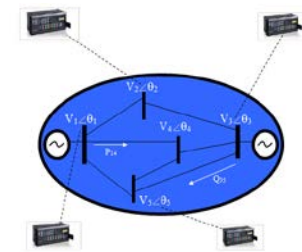
New Visualization Approaches



DERMS Platform Evaluation



Modeling & Simulation



Synchrophasors

Grid Situational Awareness Tool (GSAT)

Research & Development

FEATURES

Geospatial Display

Event Detection

Weather

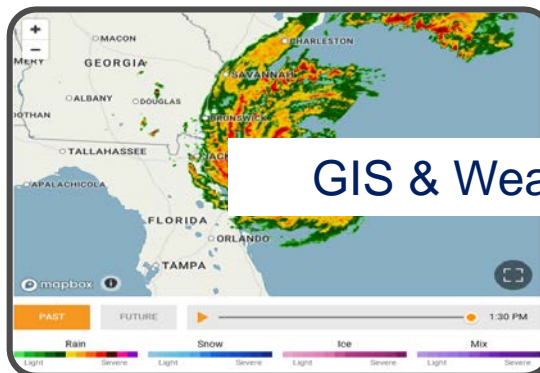
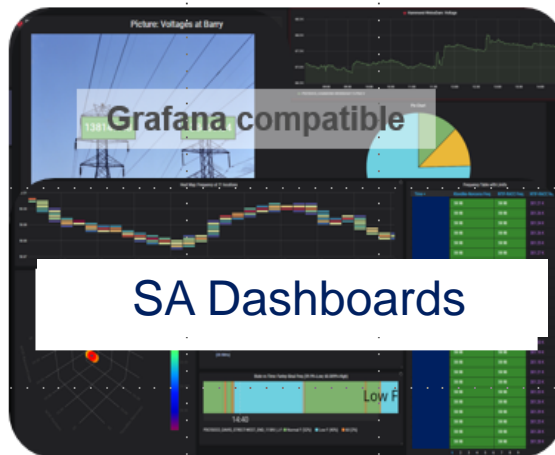
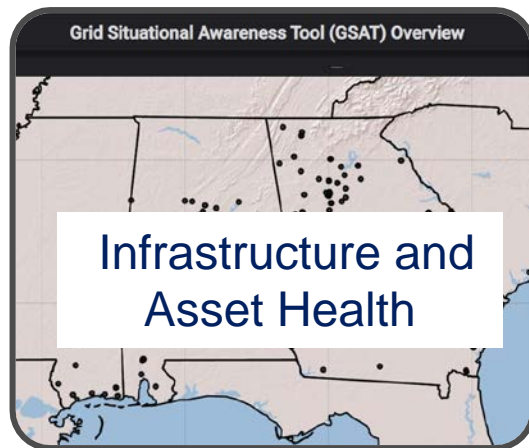
SCADA

Infrastructure & Asset Health

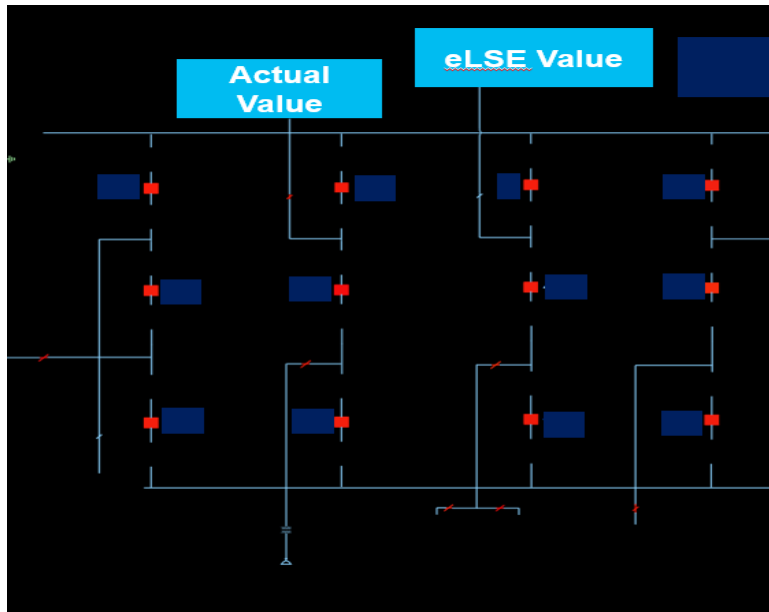
Contouring (Voltage, Freq, Angle)

Operating Boundaries

Event Replay & Analysis



Goal: Assess feasibility to provide situational awareness of the bulk power system state, and to provide an independent monitoring platform to support system operations.



Increased Wide
Area Situational
Awareness

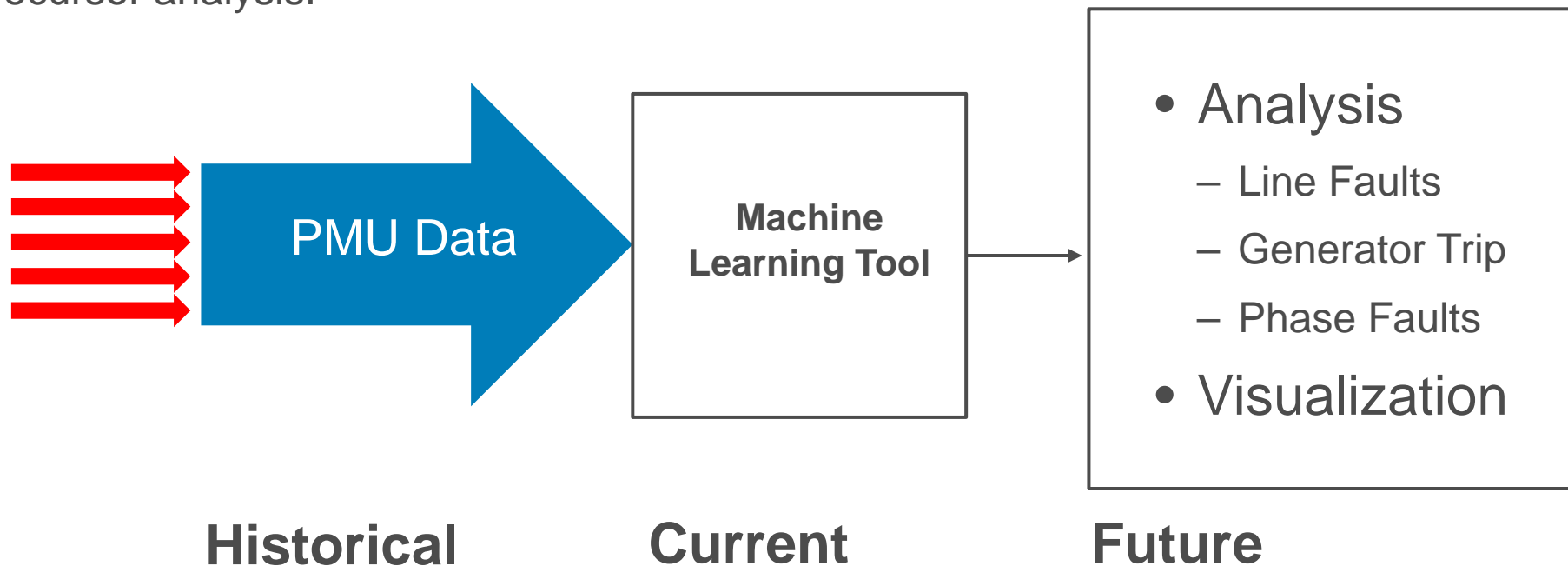
Model
Validation

Independent
from SCADA

Data Validation
and Verification

EPRI's Synchrophasor Based Machine Learning Tool (SBML):

development of machine learning techniques using synchrophasor data for event precursor analysis.



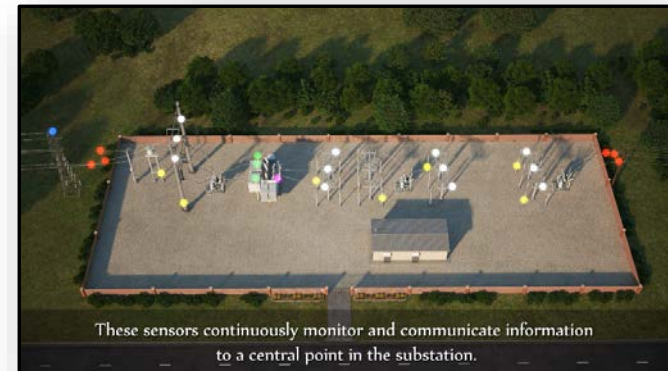
Installed Sensors

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



Expected Benefits

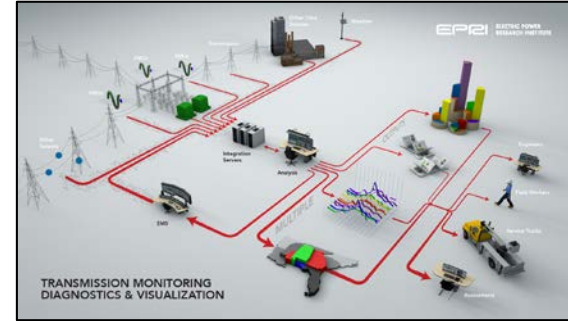
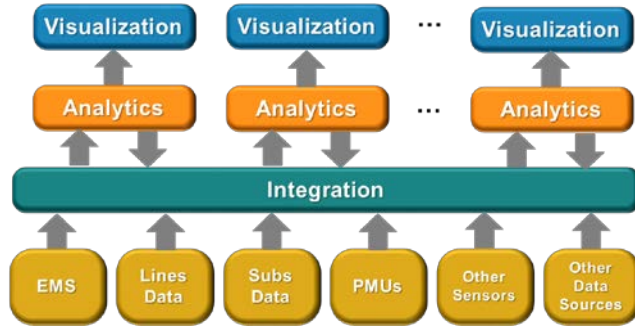
- Safety & Reliability
- Increased Operator Awareness
- Forensic Analysis
- Accelerate Individual RF Sensor Development
- Enable learnings from field application for analytics development



Transmission Monitoring Diagnostics & Visualization (TMDV)

Research & Development

Design



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

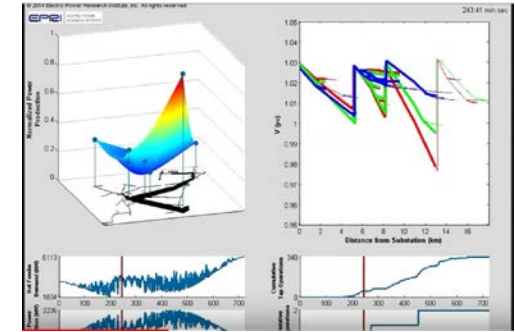
Explorers (AI etc.)



**Gaming
Application**



**On-Time Flight
Visualization**



**Solar Generation
Analysis**

**Applications in other
industries**

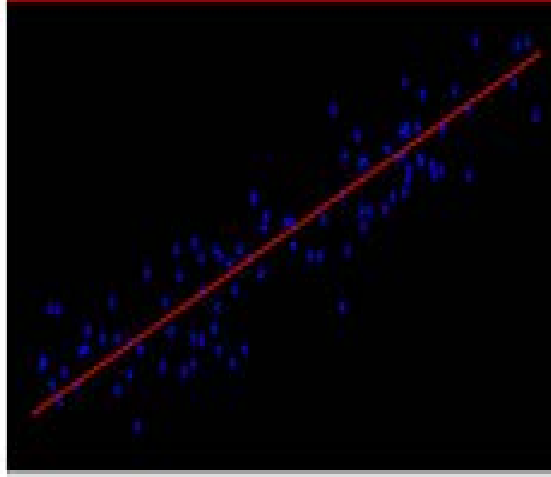
**Applications Power
Industry**

EPRI: Alarm Visualization and Assessment Tool (AVAT)

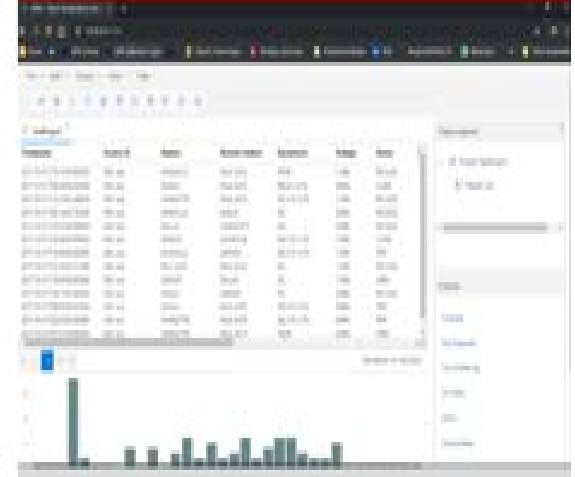
Alarm System Assessment



Predictive Analytics



Root Cause Analysis



Real-time Digital Simulator (RTDS)

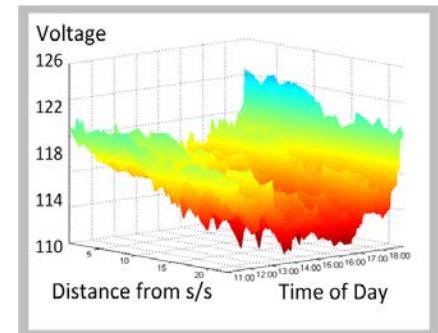


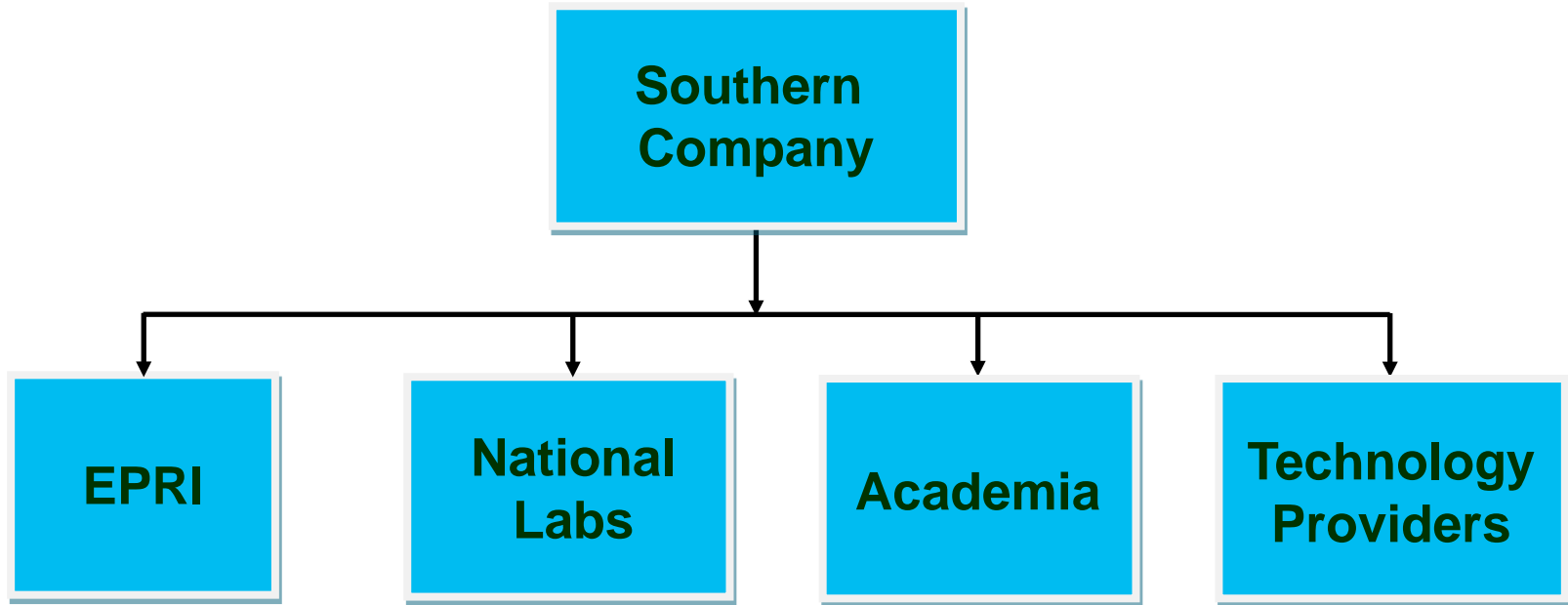
- Hardware in the loop testing
- Simulation of the Power system incorporating
 - Smart grid applications
 - Distributed generation - wind, solar, fuel cells...
 - True hard real time response for closed-loop testing
 - Protective relay testing - line, transformer, busbar, generator...
 - Control system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

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

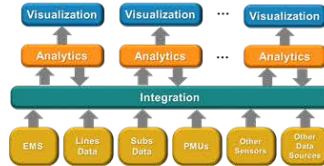
Edge of Network Grid Optimization (ENGO) Device

- 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)





**Big Data
Analytics & AI**



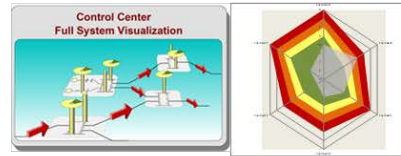
**Cybersecurity
Solutions**



**Control Center
of the Future
Functionalities**



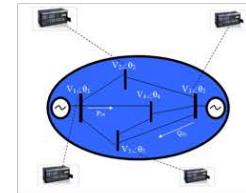
**New Visualization
Approaches**



DERMS Platform Evaluation



Modeling & Simulation



Synchrophasors

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



Southern
Company