Synchrophasor Technology at Colombian New Control Center
Experiences on implementation

XM
Colombian Power System Operator
What We Need

- Blackout
- SIRENA Initiative
  - A first approach

Timeline:
- 2007: Start iSAAC Project
  - WAMS prototype
  - How SM helps in operation?
- 2012: SM in NCC
  - Operative platform
  - Developed Apps
  - Infrastructure
  - How SM helps in operation?
- 2016
- 2017
- 2027: Continuous Evolution
  - Architecture
  - Apps
  - WAMS and WACS

- Detect and prevent oscillation events
- Improve Situational Awareness
- Architecture and applications
- SM to complement SCADA System
- Comply the Expectations of XM

500 kV network supervised

R&D prototype with data for Control Center Operators

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We visualize the synchrophasorial technology like the platform that **complements** SCADA supervision and would **support** the system in some scenarios of unavailability.
Current WAMS Implementation at Colombian System Operator

Measurement

Telecommunications

WAMS PRODUCTIVE

Level 1
Measurement

Level 2
Telecommunications

Level 3
Data Architecture

Level 4
Synchrophasor Applications

Applications

Architecture
**Architecture**

**Before**
- Siemens Control Center
- No integration
- SP*

**Now**
- Siemens New Control Center
- SP*
- IEC 104
- ICCP
- NCC

**RDS**
- RTU
  - ICCP, IEC 101, IEC 104
- SIGUARD
  - IEC 104
- PhasorPoint
  - IEC 104
- Other
  - ICCP, IEC 101, IEC 104

**Different sources to same point**

* Synchrophasor Platform
** Redundant Data Source
Applications

- Oscillations detection
- Islanding detection
- Frequency supervision
- Voltage supervision
- PMU simulation
- Alarms and events
- Calculating data
- Power flows supervision
- Customize visualization
- Exporting historical data
- Data access

All this applications and functionalities are within our new Platform

Oscillation Colombia-Ecuador of 0.4 Hz mode - Show on Control Room
User Interface Used in Control Room

- Angle supervision
- Layer of power flow
- Frequency supervision
- Oscillation detection
- $\Psi^+$ Phasor Supervision
Hybrid State Estimator

Now our Operational SCADA use Angles measured provided by PMUS

- Tests for Hybrid State Estimator, Started
- Understand and verify the results
- Identify aspects to improve if needed
- Each New PMU is added to Hybrid State Estimator
Change Management

- Involve Operators to Synchrophasor technology and show its advantages.
- Operators must take an active role to feedback synchrophasorial platform.

Aspects to Improve

- Amplitude and damping chart.
- Frequency as input signal to Power Swing Recognition.
- Access to Synchrophasor data through external queries.
- Chart with the maximum and minimum frequency measured.
- Islanding detection using angle differences and time criteria.
- Geographical and multilevel map.
- Capability to set voltages and power flows that the user consider important to supervise on a multilevel maps.
- Platform where user creates their own on line or historical x-y charts.
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