Initial approach for monitoring online angular coherence between State Estimator and Syncrophasor measurements

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Two complementary IT systems?

SCADA
Traditional State Estimator
Angles are calculated

WAMS
Syncrophasor Measurement
Angles are measured

**Methodology**

**Why?**
- To validate that the measured data represents the reality of the electrical system.
- To provide reliable data to operators.

**How?**
- Identifying coherence between both systems
- Verifying data quality
- Filtering & conditioning corrupted data
- Indicating abnormal situations between systems

**What?**
DQ-Prototype: Coherence EMS/WAMS
How? - Methodology developed
¿Which represent better the real state of the system?

State Estimator Angles (θ) & WAMS Angles (φ) [1]

• Complementing the capabilities of both IT systems
• Identifying aspects to improve in both IT systems
**What? - WAMS architecture**

- **Visualization**
- **Data Process**
- **Telecommunications**
- **Measurements**

Diagram showing the architecture with labels for SCADA/SE, WAMS, PhPO/SIGUARDG/OpenPCD, and User.
You have to use a reference node to compare both systems.

This shows the importance to select a “good” reference node.

Off-line tool developed in stage 1: First results obtained
Off-line tool developed in stage 1: First results obtained

Identifying un-synchronized PMUs.

It is obtained when the reference is unsynchronized.

It is obtained when one PMU is unsynchronized.
How does it work? – Coherence EMS/WAMS Prototype

1. Chart tools
2. Types of data to display
3. Data Quality Chart
4. Online Chart
5. Series: Each node
Show how outdated the SE results are.

The difference between SE and WAMS it reduces.

A new SE result.
Angular difference between SE and WAMS when:
- Power system presents a topological change
- SE update results

Differences between SE and WAMS are reduced

Indicate operators for:
- Important changes in power system
- Updated SE results
Analyzing the results - Coherence EMS/WAMS Prototype

- The methodology has been developed to monitoring in a quantitative way how coherent the systems are.
- The comparison has shown to be helpful, for example, by finding errors in either of two systems.

This proposal allows us to identify:

- Zones that need calibration of parameters and/or measurement data on State Estimator
- Synchrophasor measurement aspects like inverted phases, desynchronization, invalid data, noise data
What we imagine in the future? - Coherence EMS/WAMS Prototype

This tool shows quickly:
• Where an event occurs and its implication
• A change of condition of the system.
• A bad PMU measurement or synchrophasorial issue.
• Help to tune parameters of system in SE

Important:
• This tool improves if it increase the amount of PMU
Any question, advice or to work together, please contact us

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