CASCADING OUTAGE PREVENTION IN COLOMBIA
PROBLEM

All the decision are centralized

Power system is covered only under n-1 contingencies.

No synchronized data
HOW WE PREVENT CASCADING OUTAGES BEFORE WAMS?

Restrictions of power transportation on the transmission network are identified using criteria previously defined.

Contingencies are evaluated previously to real-time in order to maintain the stability under n-1 contingencies.

Long, medium and short term planning of generation resources and transmission, in order to guarantee accomplish with the stability and reliability criteria.

However is not possible to have a 100% secure system because the size and complexity of power system makes difficult to prevent all the possible events.
Normal maintenance maneuvers. + Detection of a non fault current by the protection system. = Blackout

COLOMBIAN BLACKOUT 2007

Normal maintenance maneuvers. + Detection of a non fault current by the protection system. = Blackout

Frequency (Hz)

Time (s)

Torca 220 kV

Guavio
Under frequency relay activation shedding 15 % of the demand.
SOLUTION
ACTIONS AFTER BLACKOUT

- Blackout 2007
  Learning lessons

- Sirena Project
  (2007 – 2012)

- iSAAC Project
  (2013-2025)
The goal was the first steps for that the system responded to unusual events of big impact.

**Key Elements**

- Use of newest technology for power systems monitoring (PMU)
- Intensive use of telecommunications
- Implement new methods for simulation and analysis of power systems.
WAMS/SITUATIONAL AWARENESS – SIRENA RESULTS
The goal is develop the architecture for the future supervision and real time control.

1. Syncrophasor measurements
2. Communication based in IP
3. Functionality distributed in substations
4. Advanced protection schemes
5. Situational Awareness
ROAD MAP FOR ISAAC INCREMENTAL DEVELOPMENT

2015
(Current Status)
- Working WAMS
- Conceptual Design finalized
- iSAAC Roadmap finalized

2016/2017
- WAMS & SCADA/EMS integration
- Detailed Technical Requirements for iSAAC software architecture
- Technical Requirements for IDD

2020
- Advanced supervision (no protection and control)
- Some SIPS implemented [with PMUs+IDD]

2022/2023
- Collaborative Protection (no control)
- Full IDD implementation
- PMU based Volt/Var control

2025+
- Complete iSAAC implementation
- Frequency control
iSAACNet

Data Bus

SuperPDC

IDD/PDC

PMU 30/60 fps

Substation 1

Stakeholders CC

PMU 30/60 fps

Substation n
CONCLUSIONS

WAMS

ADVANCED SUPERVISION

PREVENTING CASCADING OUTAGE

COLLABORATIVE PROTECTION

REAL TIME PMU APPLICATIONS