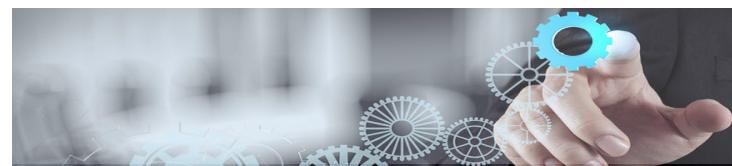


# ONS Real-Time Dynamic Simulator

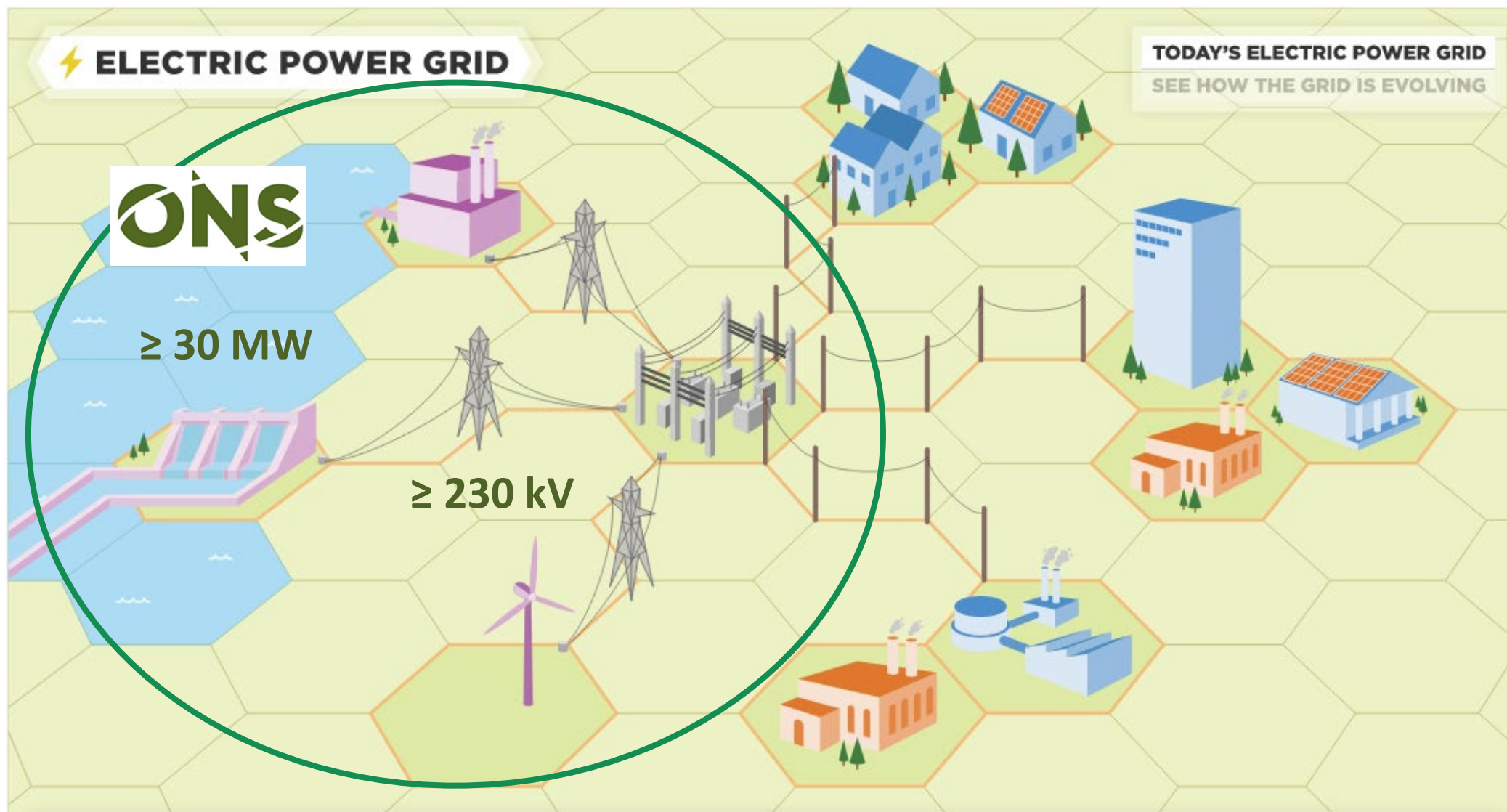
**Arthur Mouco Ph.D.**



# Brazilian ISO Challenges

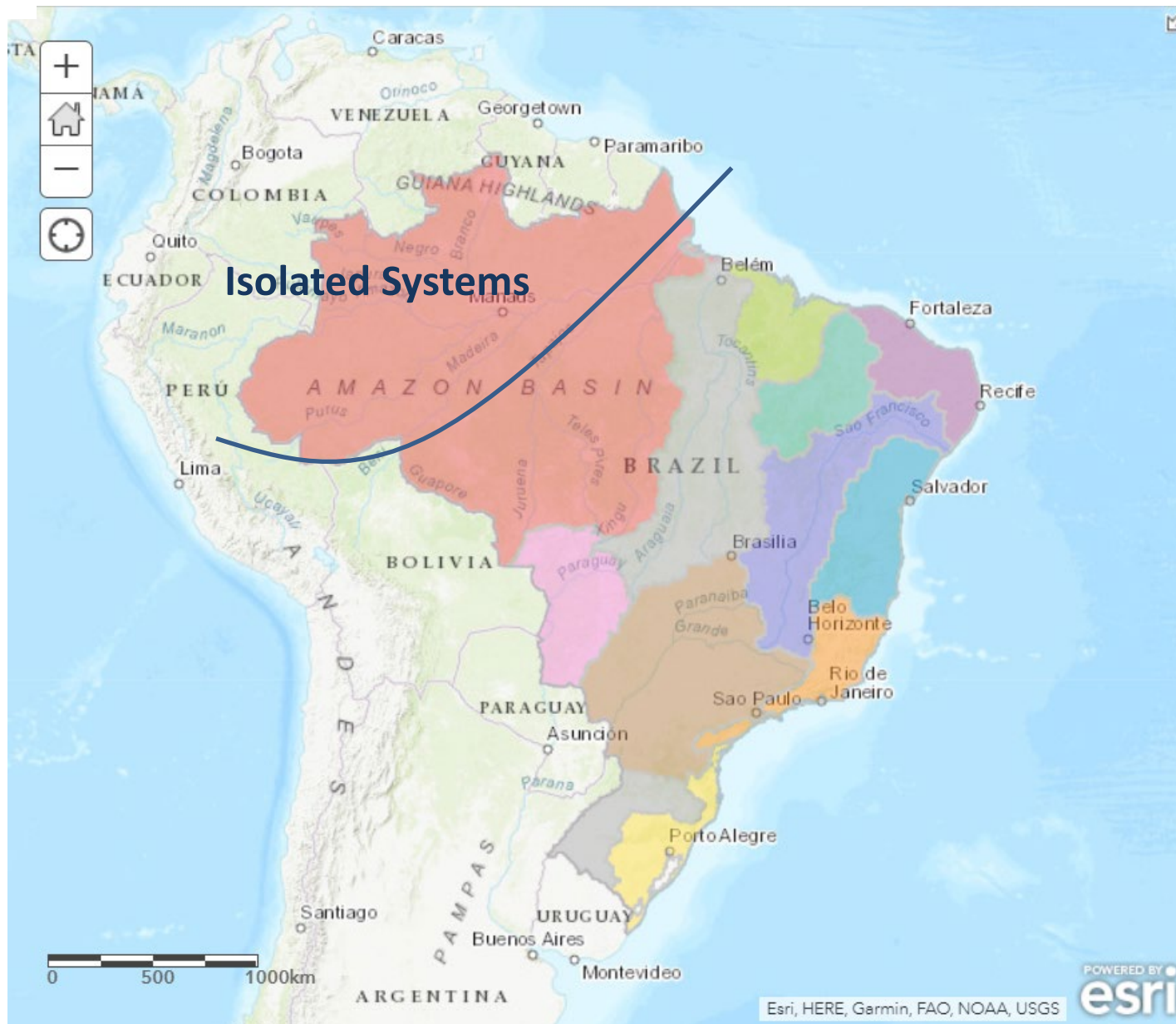






Source: [www.epa.gov](http://www.epa.gov)

# Brazilian ISO



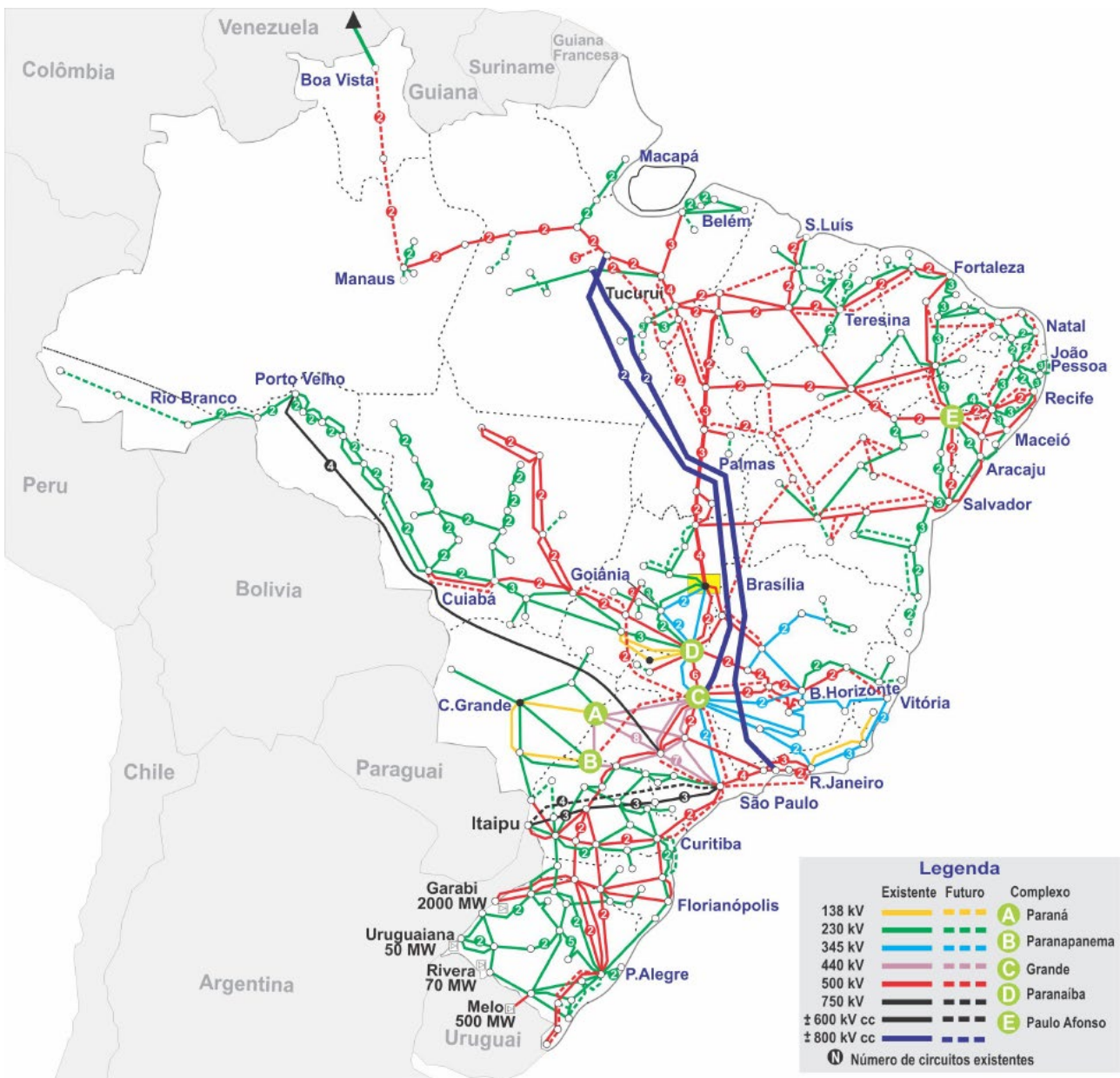
**99% Brazilian Load**

**Isolated Systems**

**≈ 300 cities**

**Small thermal power plants**

# Transmission System



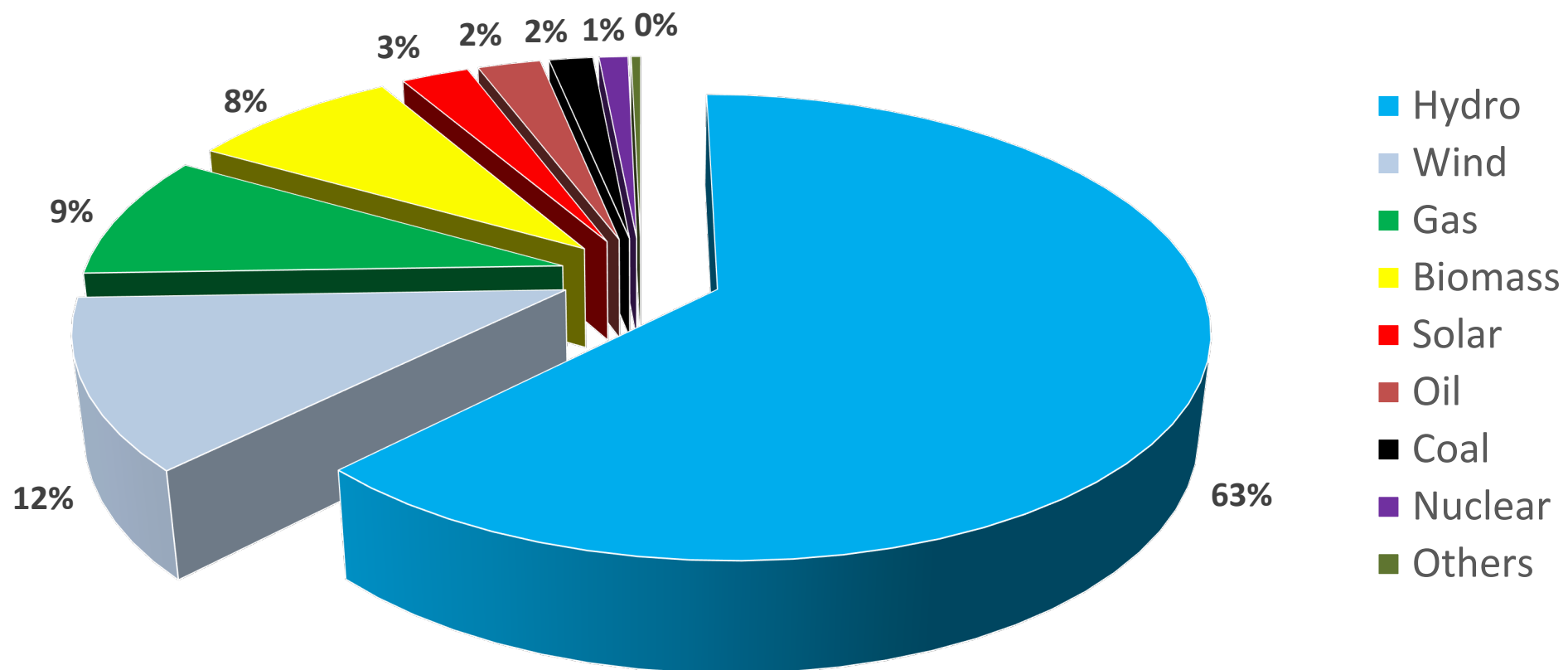
**2020**  
➤ 145.600 km

**2025**  
➤ 184.054 km

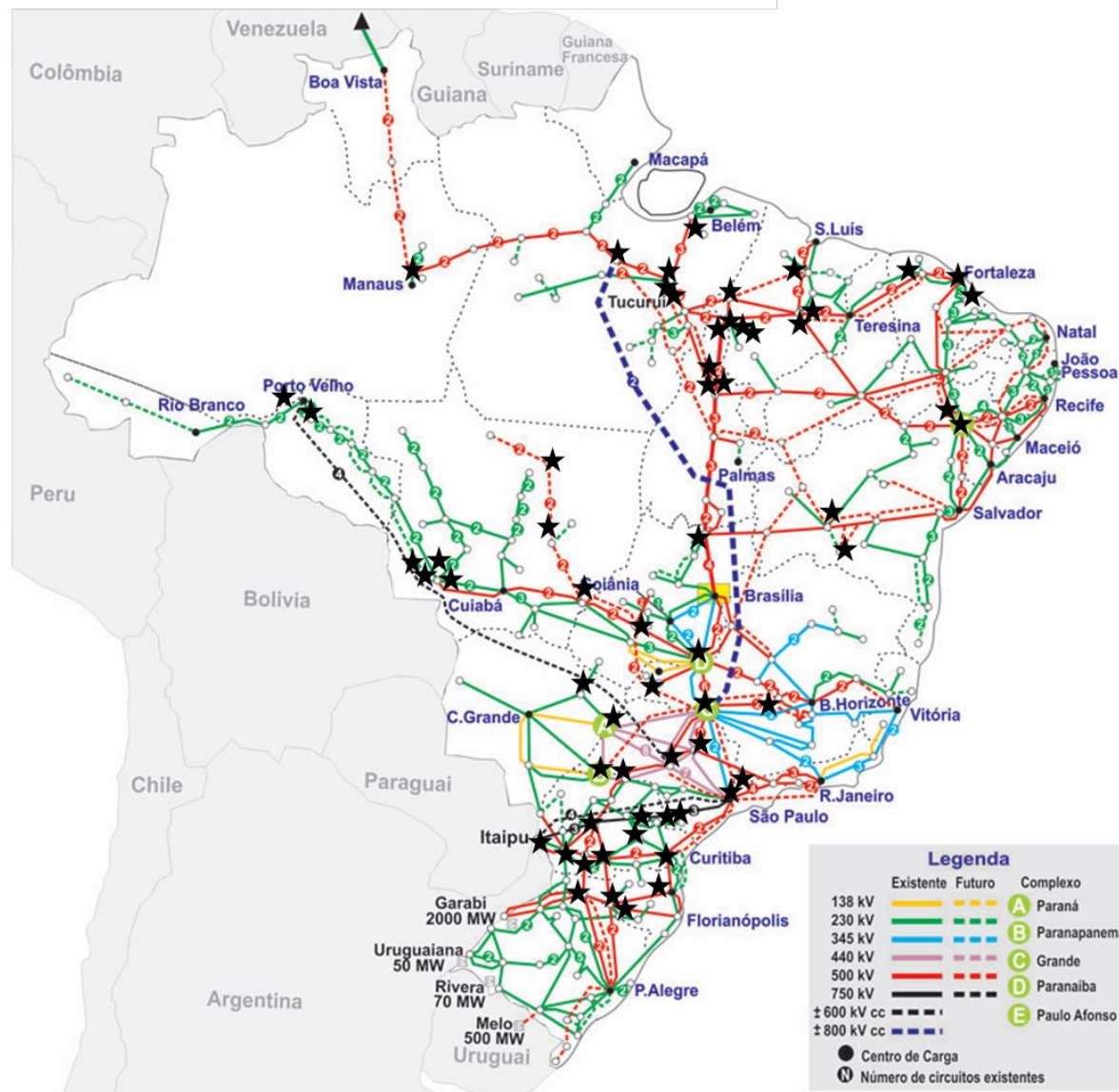




**Total 174 GW**



# PMU Deployment



## Status

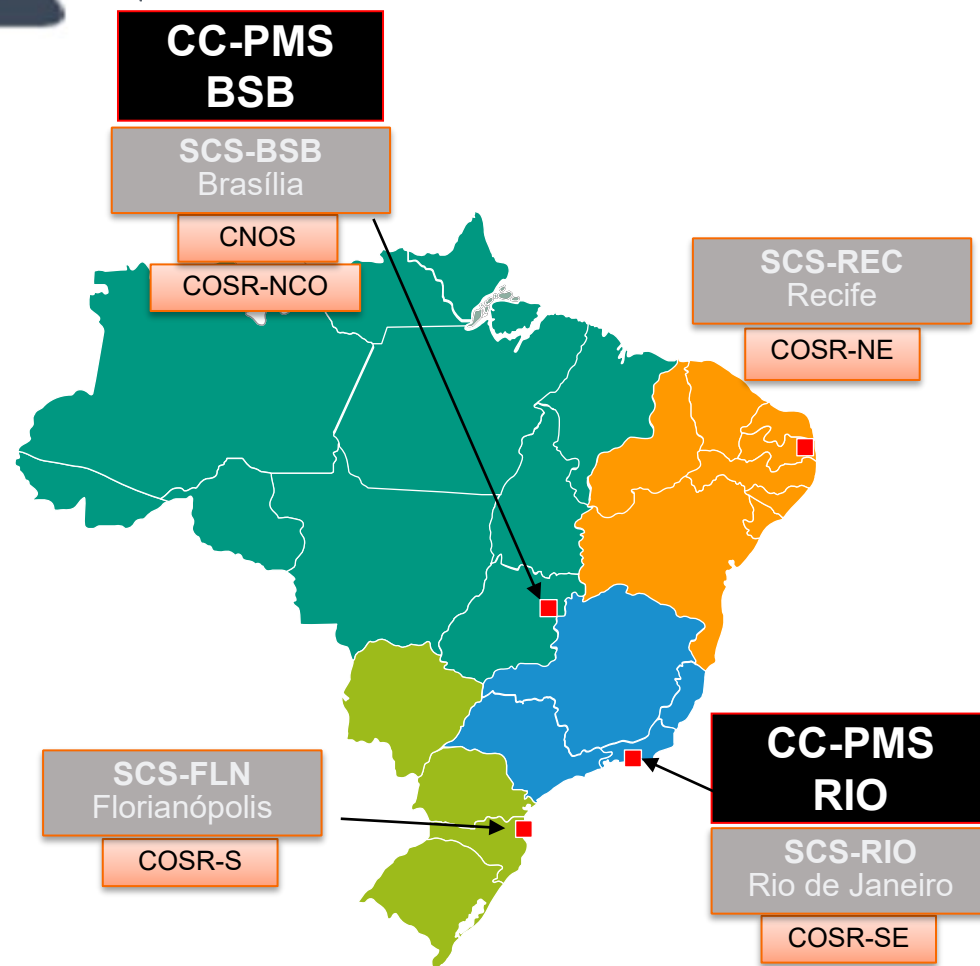
220 PMUs in OP  
72.28 % good quality  
40 PMUs not in OP

Availability 99.95 %

1000 PMUs  
6000 phasors  
10000 Digitals

} at 60 fps

# CC-PMS - Layout



**SCS** - Supervision & Control System (4 sites)

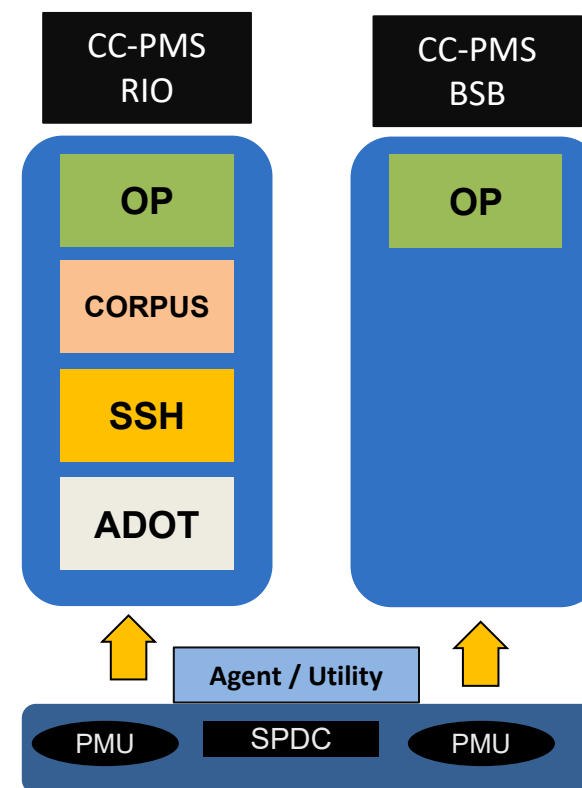
**CNOS** - National Control Center

**COSR-NCO** - North Central-West Regional Control Center

**COSR-NE** - Northeast Regional Control Center

**COSR-SE** - Southeast Regional Control Center

**COSR-S** - South Regional Control Center



**OP** - Operation Production

**CORPUS** - Corporate User System

**SSH** - System Staging & Homologation

**ADOT** - Application Development &  
Operator Training

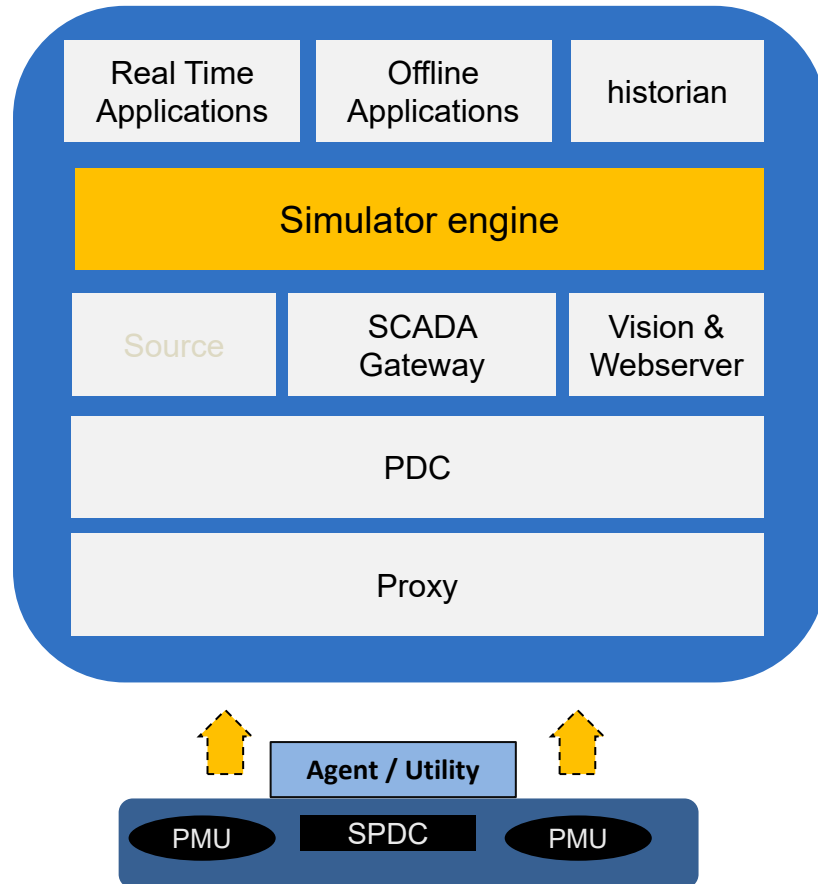
## Real Time

Alarm Management  
Composite Alarms  
Oscillation Monitoring  
F, V&I, Power Flow Monitoring  
System Disturbance  
Islanding & Restoration  
Dynamic Stability Assessment

## Offline

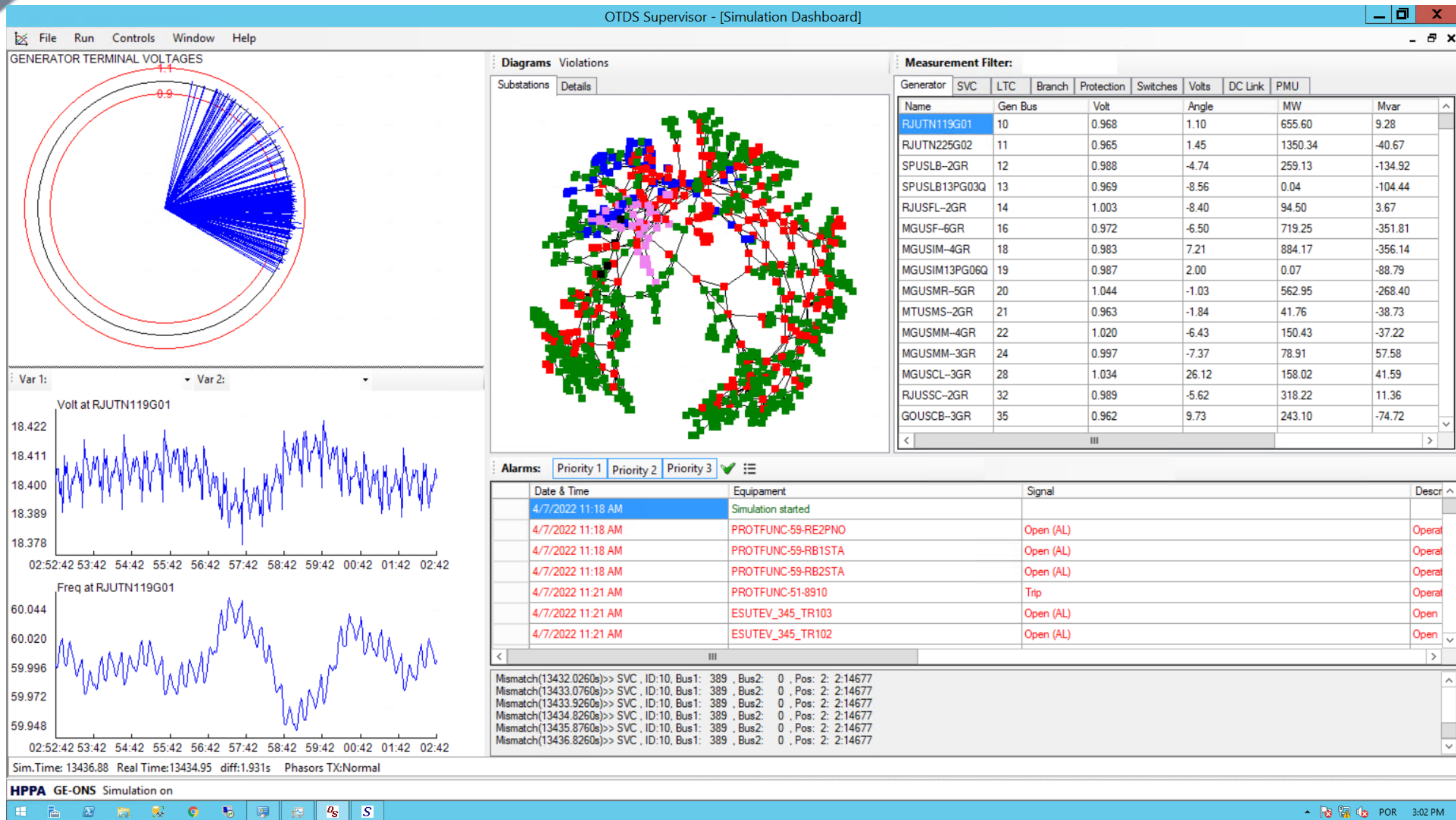
User Calculations  
Spectral, Modal & Event Analysis  
Reporting capability  
Training Environment  
Historical Event Storage

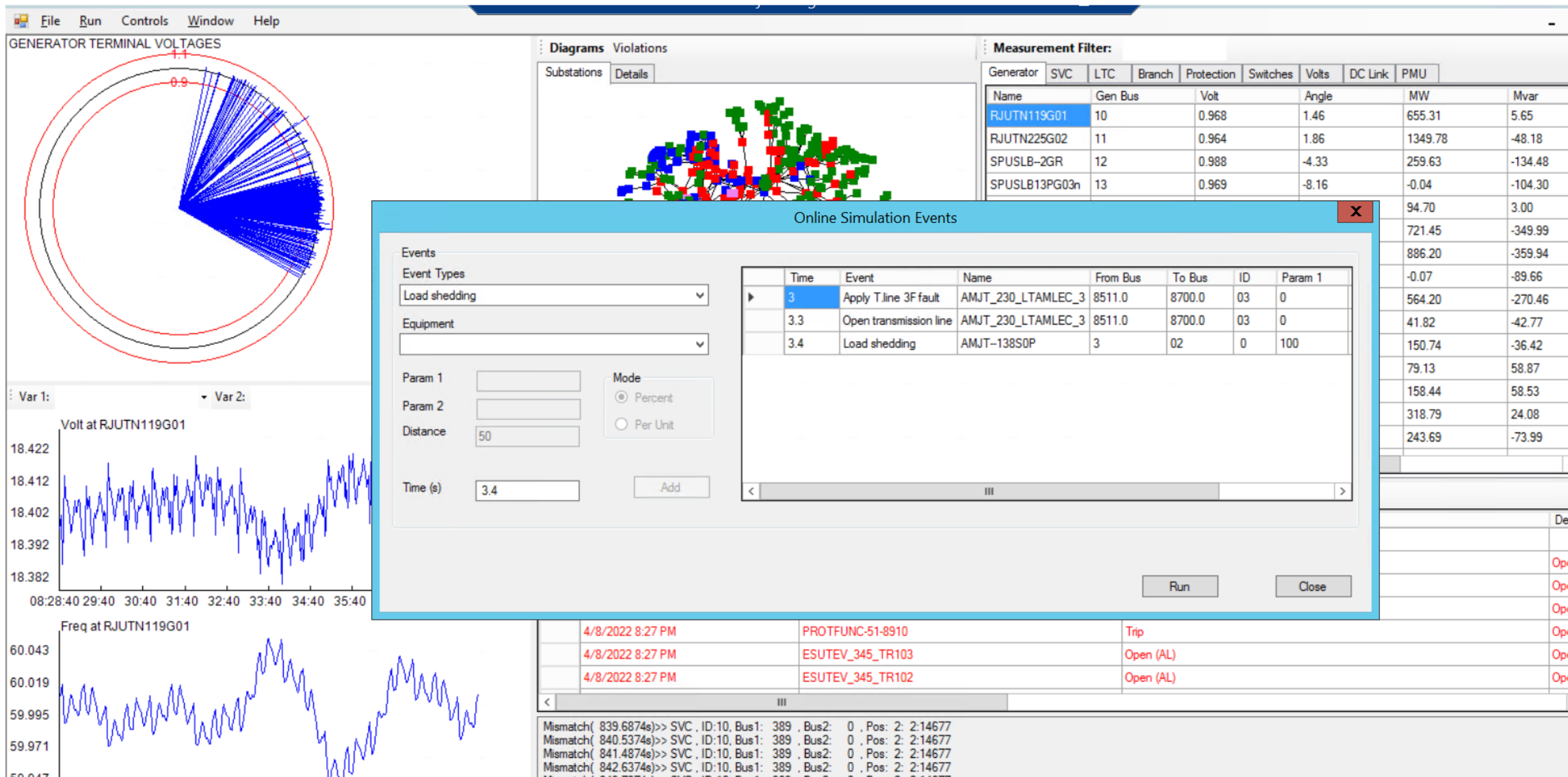




## Special characteristics:

- Simulator – generates current and voltage phasors based on fully electromechanical models. These phasors are sent to PDCs at a rate of 60 ftp using the IEEE C37.118 protocol and then sent to be consumed by applications in real time and offline. The simulator allows you to do:
  - Start / stop the simulation
  - Changing generation & load
  - Open & close equipment's (LT / TR / SC / EC / RE / CA )
  - Separate & reconnect bus bars
  - Generate errors in loads and phasor measurements
- The dynamic models are the same as those used by the planning and engineering teams and benefit from the evolutions made in the database of dynamic models by these teams.
- Supported models: hydraulic generators, wind generators, thermal units, HVDC, different load models, protection schemes. All lines and transformers receive standard protection automatically (zone protection, bus protection, etc.)







# CC-PMS – Simulator Characteristics

**Real time Environment – What was observed by a PMU near the problem**

Simple to use - get a pre fault base case from State Estimator, started a simulation with it and do the actions to generate the disturbance.

**Simulator – What was observed by the same PMU**



# Team



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Senior Power Systems Engineer



Hector Volskis  
Power Systems Specialist



Janio Los  
Senior Power Systems Engineer

Thank You!



# Questions?

