Stability Analysis in Central America's Power Grid

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ABSTRACT

Finding the source of instability is key in ensuring an electric power grid proper functioning. This poster shows the results obtained from a stability analysis performed in Central America's power grid in order to find the source of instability of that grid.

INTRODUCTION

- Stability refers to the equilibrium between energy generated and energy consumed in a grid.
- A stable grid is able to regain its equilibrium after a disturbance (Kundur, 1994)

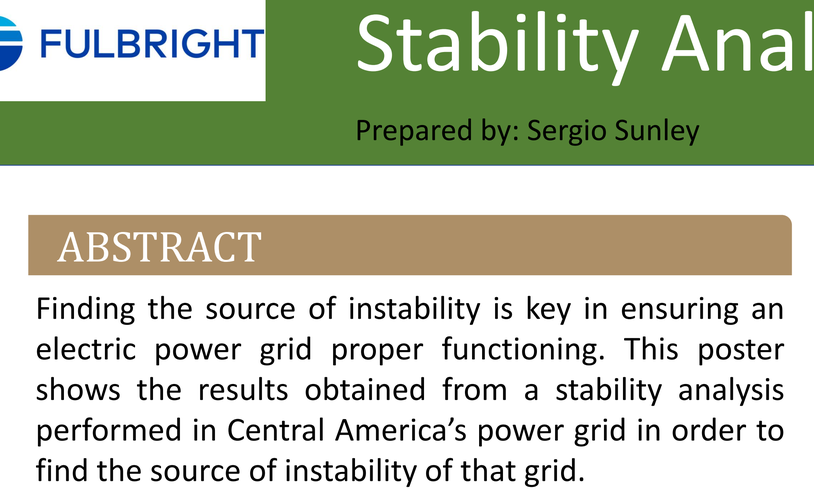

Figure 1: Oscillation formation process. Adapted from Agudelo & Parra (2008., p.14)

- Oscillations que can be quantified using the following parameters: damping, amplitude and phase.

- Central America's grid has recently experienced disturbances that has endangered its stability (Bolaños et al., 2017). In these scenarios, Northern and Southern regions of central America's Power System are the sources of electrical instability, since these are the areas with larger power grids

METHODOLOGY

Synchronized measurements were used to calculate oscillation parameters

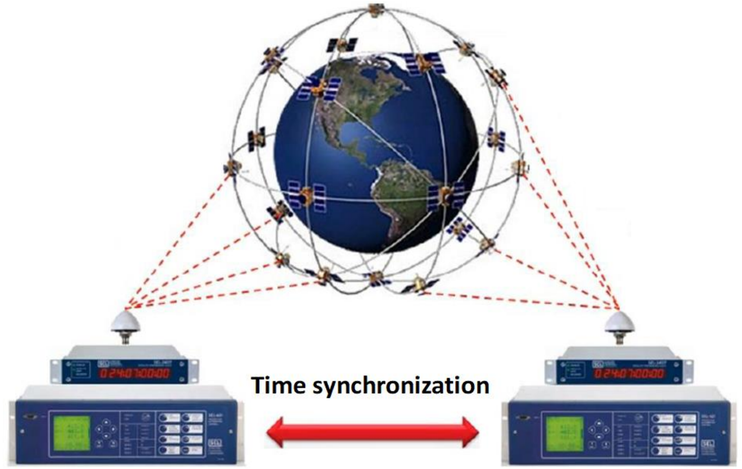

Figure 2: synchronized measurements. Adapted from Srivastava (n.d., p.28)

RESULTS

Study case: Loss of 100 Megawatts (MW) of generation in the Electric System of Panama, causing oscillations between Central America and Mexico.

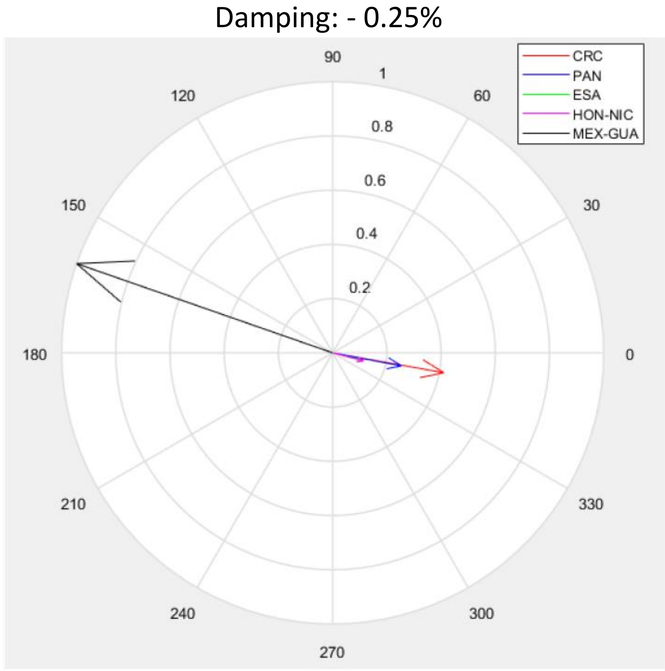

Figure 3: Study case results. From Bolaños et al. (2017, p.146)

CONCLUSION

According to the analysis carried out in Central America, the generating areas of Costa Rica, Panama and Mexico-Guatemala are those with the greatest participation (cause) in oscillations (instability).

REFERENCES

Agudelo V.M & Parra D.F. (2008). *Control de oscilaciones electromecánicas en sistemas de potencia usando el análisis modal* (Bachelor's thesis, Universidad tecnológica de Pereira, Pereira, Colombia). Retrieved from: http://repositorio.utp.edu.co/dspace/handle/11059/1729?show=full

Bolaños, G., Mendoza, J., Sunley, S. (2017). *Análisis de pequeña señal utilizando unidades de medicion fasorial en el Sistema eléctrico de potencia de El Salvador* (Bachelor's thesis, Universidad Centroamericana Jose Simeon Cañas, La Libertad, El Salvador). Retrieved from: http://abaco.uca.edu.sv/opacbfi/verdetalle_.php?idobra=177491&searchType=titulos&searchText=sunley&tipomaterial=0&cc=0&tipob=3

Kundur, P. (1994). *Power System Stability and Control*. EE.UU: McGraw-Hill

Srivastava, A.K. *Phasor Measurement (Estimation) Units*. Retrieved August 9, 2021, from: https://na.eventscloud.com/file_uploads/b9c0cedfe296b5347ce0877fbfac3753_PMU_Relay_Schoolcopy.pdf