

Innovation type:  
Methods and tools

TRL: 3

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Target group:

Actor/ purpose	x
DSO, TSO	X
Technology provider	X
Member organisation	
Market operator	
Research/ Consultancy	X
Teaching	

## Method for analysing communication failures in smart grids

*A new modelling approach is proposed for analyzing the impact of 5G communication failures in a smart grids.*

### Challenge

- The high dependence of power system on Information and Communication Technologies establish new interdependencies and vulnerabilities that need to be properly analyzed.
- New sources of failures may have a crucial impact on Smart Grid Monitoring.

### Solution

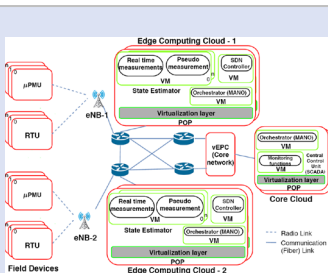
- A novel dependability analysis method which combines Stochastic Activity Network (SAN) modelling and numerical analysis is proposed and implemented in a specific software.
- The method is tested on a Wide Area Measurement System (WAMS) architecture based on 5G-URLLC radio channel and data processing virtualization.
- The method application returns a set of metrics that assess the impact of ICT architecture vulnerabilities, cyber-physical system interdependencies and dependency on environmental conditions on WAMS data accuracy.

### Potential

- The software represents a valuable tool to assess ICT architecture capability to reliably deliver data for correct monitoring. The method can be extended to perform similar analysis in control and protection scenarios.
- The results of the test enforce the prospect of adoption of 5G technology for smart grid monitoring applications.

### References in CINELDI

- T. A. Zerihun, M. Garau and B. E. Helvik, "[Effect of Communication Failures on State Estimation of 5G-Enabled Smart Grid](#)," in IEEE Access, vol. 8, 2020
- T. A. Zerihun, M. Garau and B. E. Helvik. [Dependability Modeling and Analysis of 5G Based Monitoring System in Distribution Grids](#). In Proceedings of the 12th EAI International Conference on Performance Evaluation Methodologies and Tools (VALUETOOLS 2019).



*A 5G based WAMS architecture, with monitoring and control logic virtualized and moved into an edge cloud, is analysed with a novel methodological approach that combines Stochastic Activity Networks (SAN) modelling and numerical analysis. Simulations are performed to assess the impact of failures on a distribution system state estimation*