

Performance Evaluation of Microgrids in Occurrence of Intentional Islanding

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Agenda

- I. Introduction

- II. Simulation results
 - I. Intentional islanding
 - II. Microgrid survival
 - III. Reconnection

- III. Conclusion

I. Introduction

- Increase in requests for connections of small generators in distribution networks: government incentives
- Possibility of islanding operation with microgrids disconnected from the main system
- Brazilian grid procedures for distribution networks

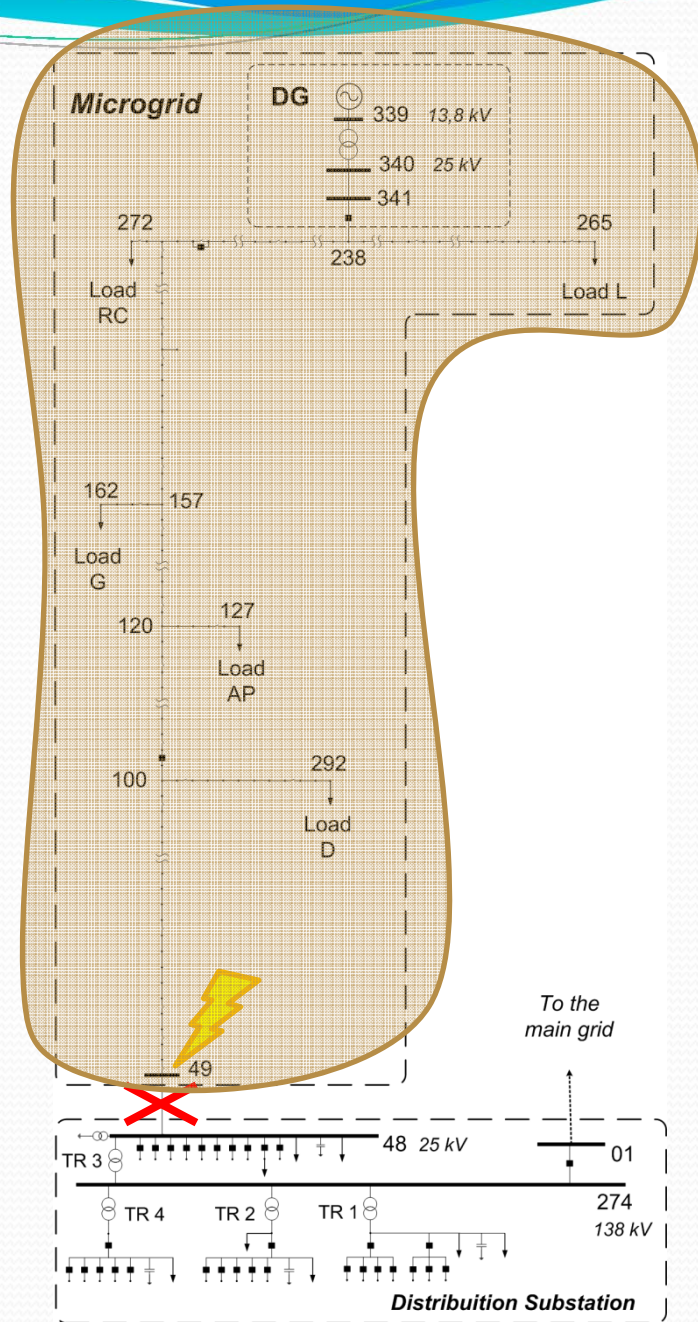
III. Analysis

- Simulation tool: software Simulight with three-phase modeling
- Performed analysis:
 - I. Intentional islanding
 - II. Microgrid survival
 - Short-circuit
 - Daily load curve
 - III. Reconnection



A) Intentional Islanding

- Event:
 - Three-phase short-circuit at bus 49
- Consequences:
 - Protection action
 - Microgrid islanding
- Is the islanding well-succeeded???



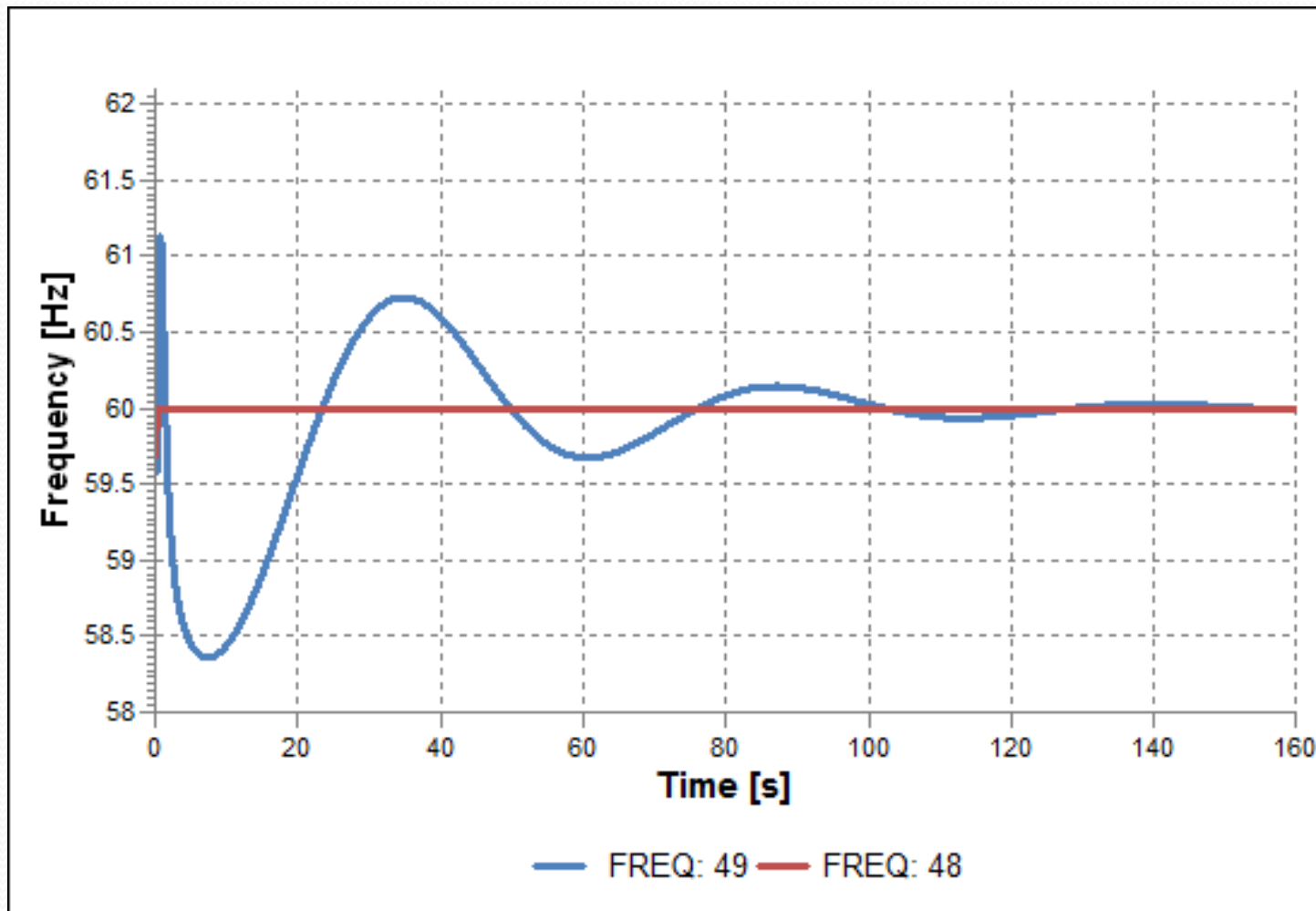
A) Intentional Islanding

- Islanding feasibility
- Scenarios:

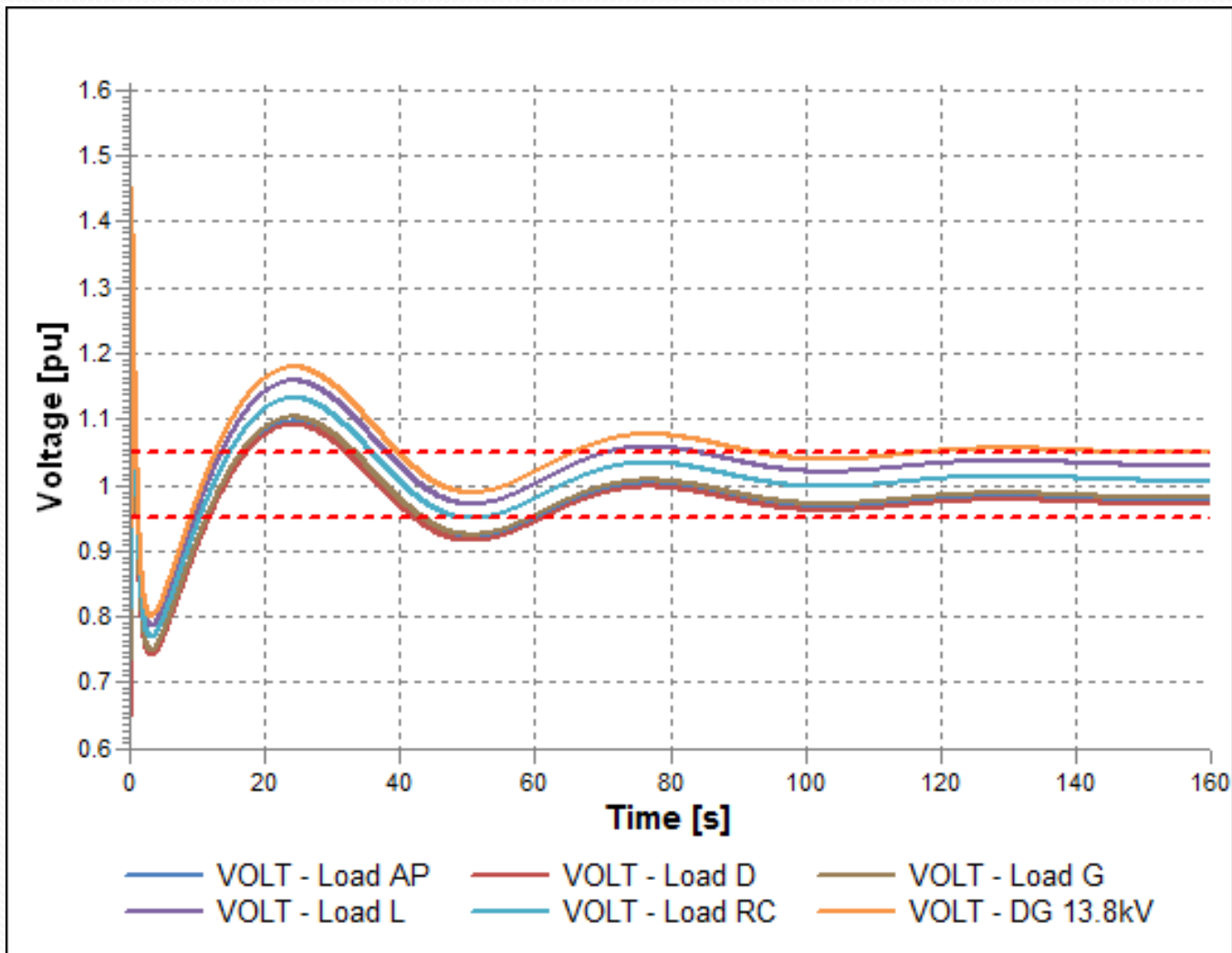
Load		Generation	
Heavy	9,3 MW	Hight	9 MW
Medium	6,2 MW	Intermediate	6 MW
Light	3,1 MW	Low	3 MW

- Unsuccessful islanding:
Heavy load and low generation scenario
- Well-succeeded islanding:
All other scenarios

Frequency at both sides of the coupling circuit breaker



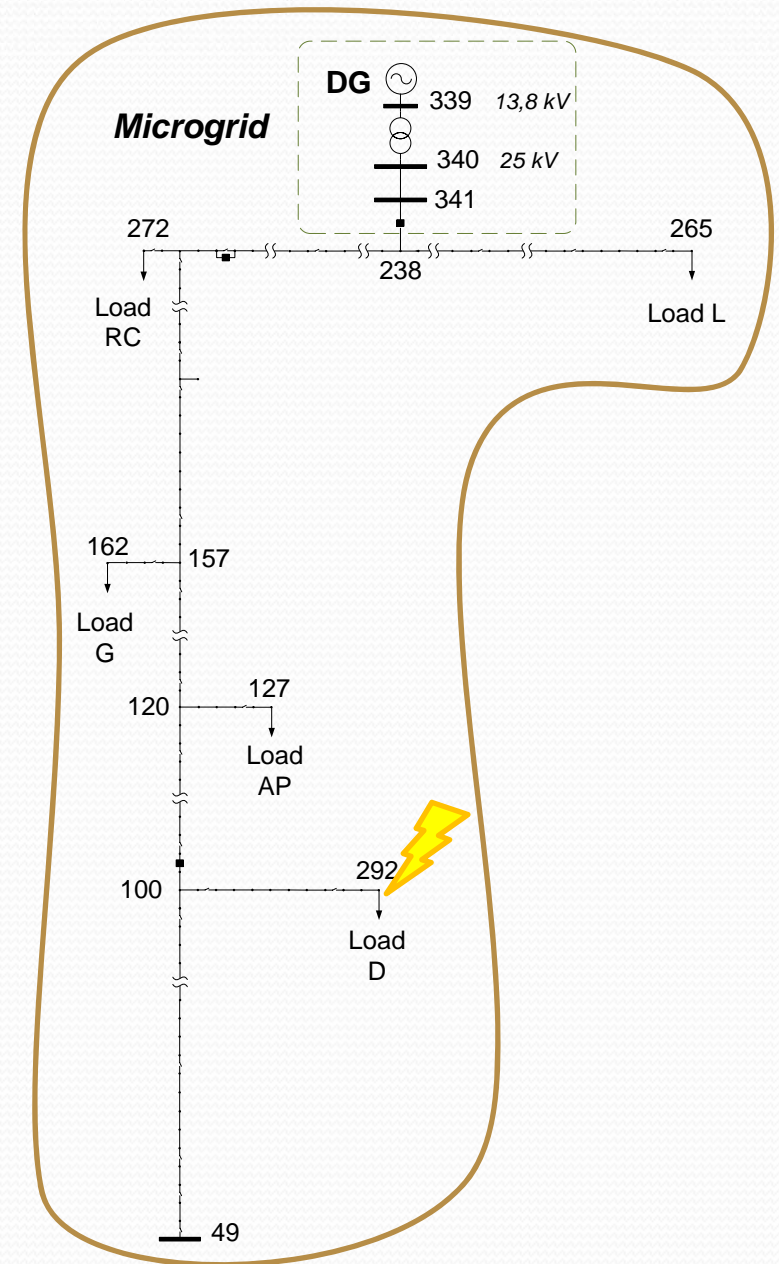
Microgrid Voltages



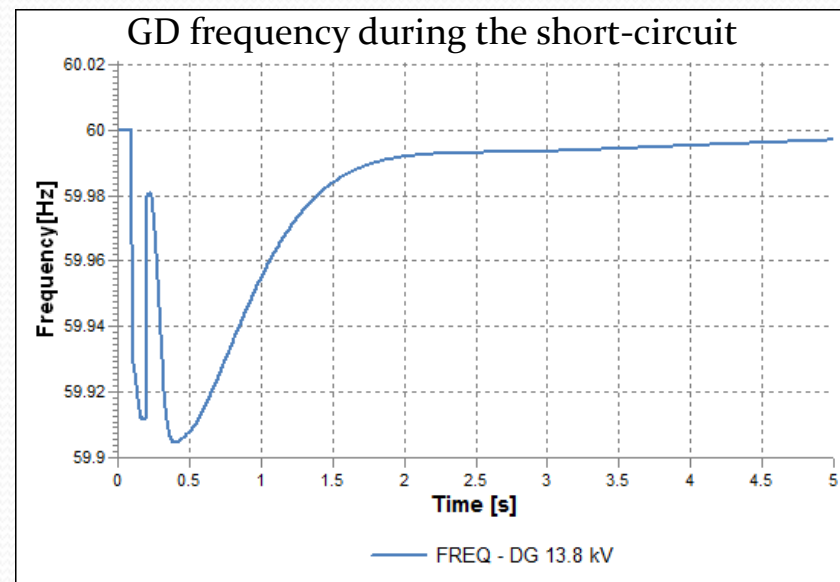
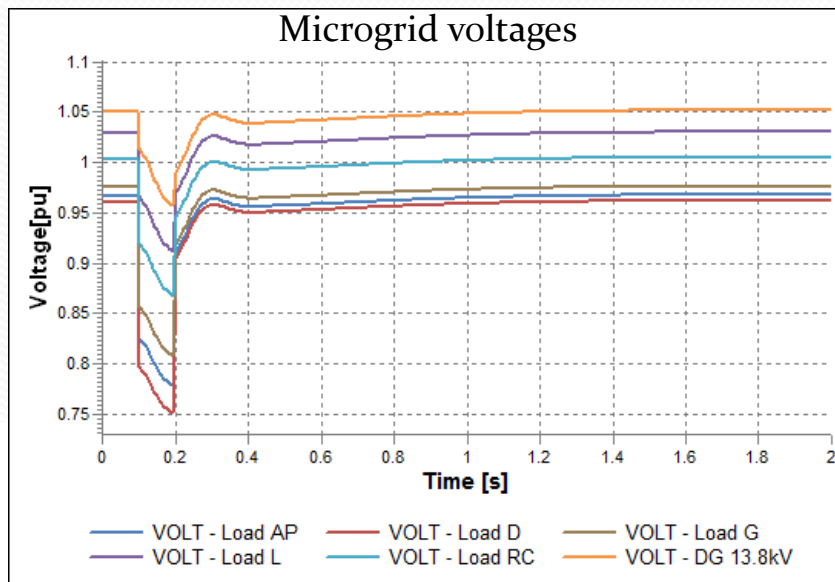
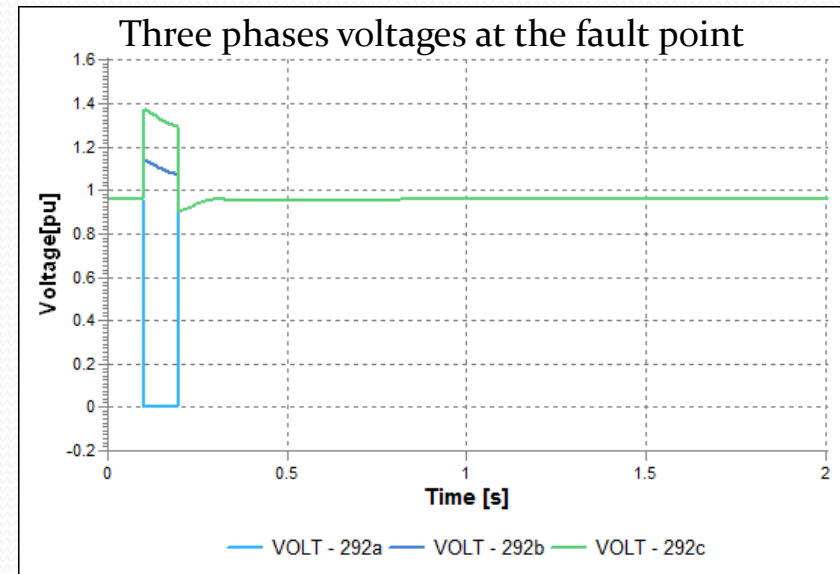
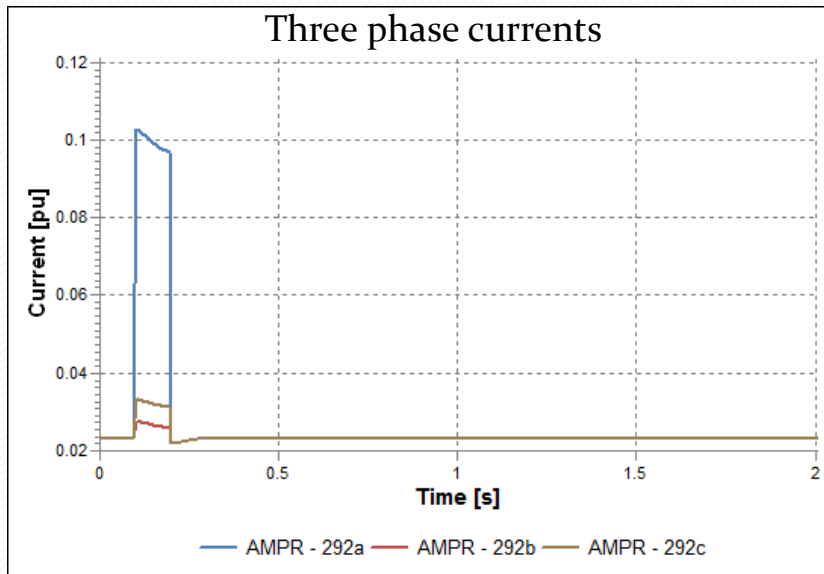
B) Microgrid Survival

- Operating in islanded mode

I) Phase to ground short circuit at #292



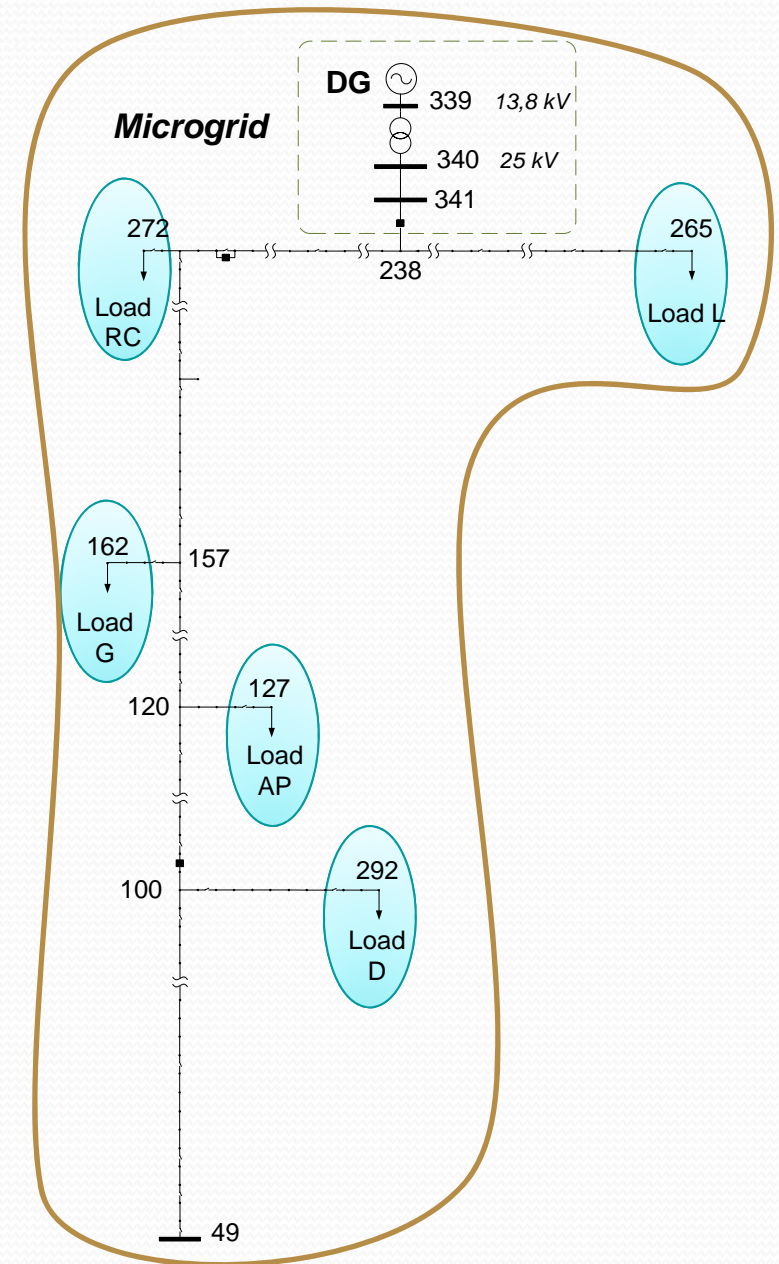
Measures during the short-circuit



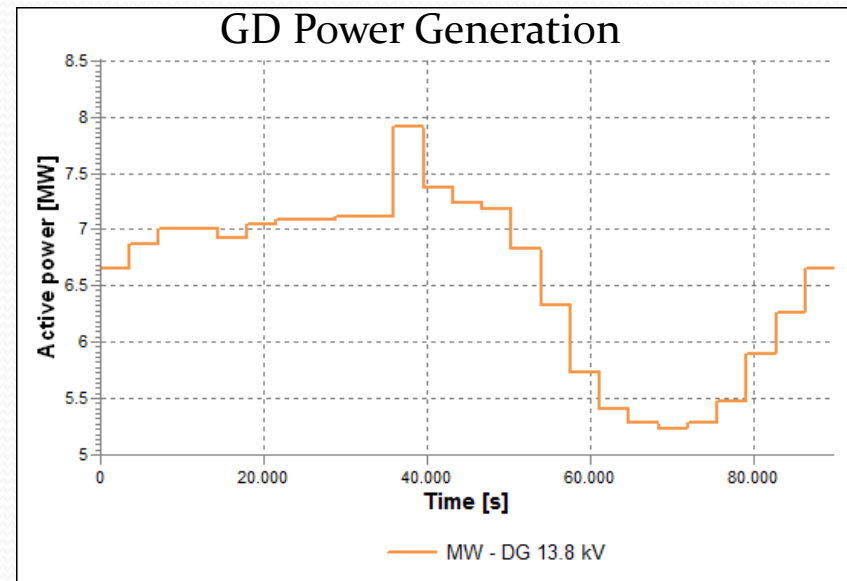
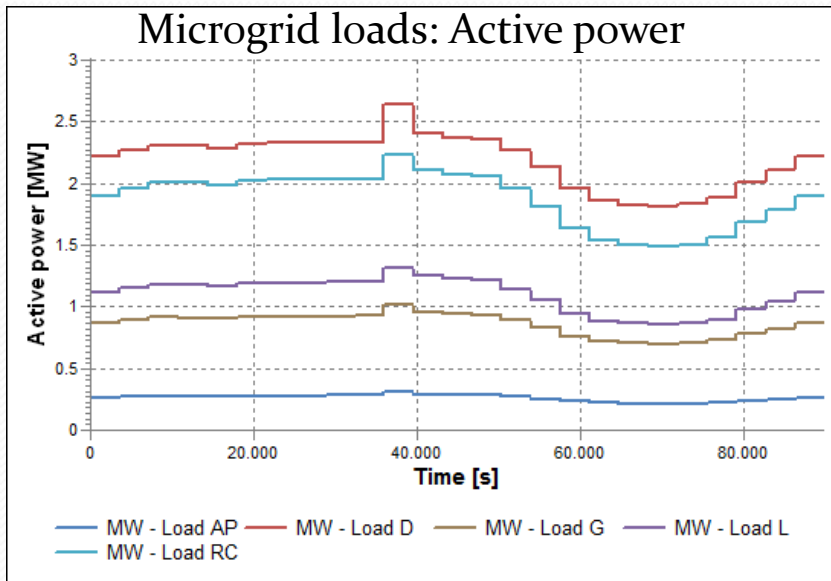
B) Microgrid Survival

- Operating in islanded mode

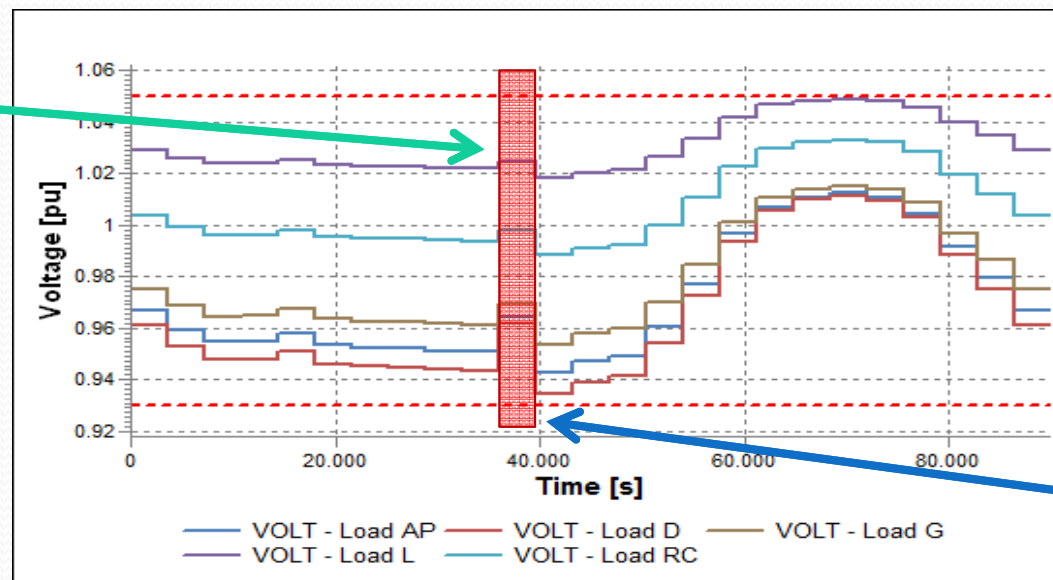
II) Daily load curve



Measures at both sides of the coupling circuit breaker



Capacitor bank on



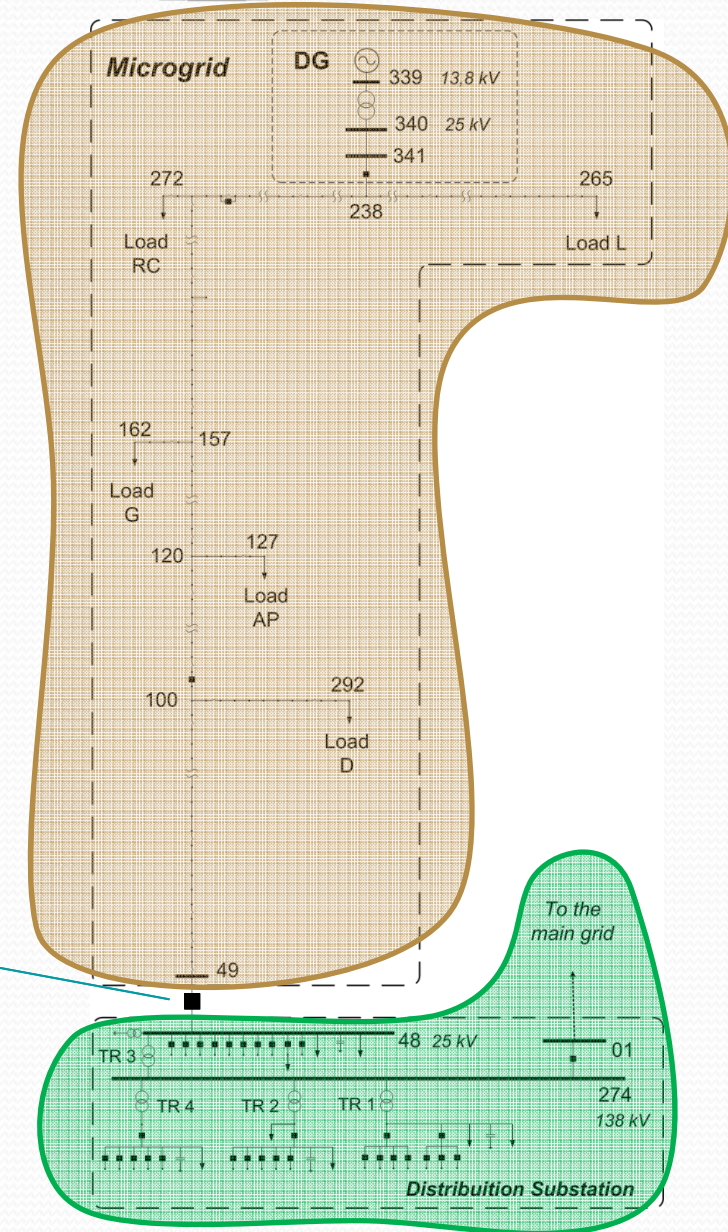
Capacitor bank off

C) Reconnection

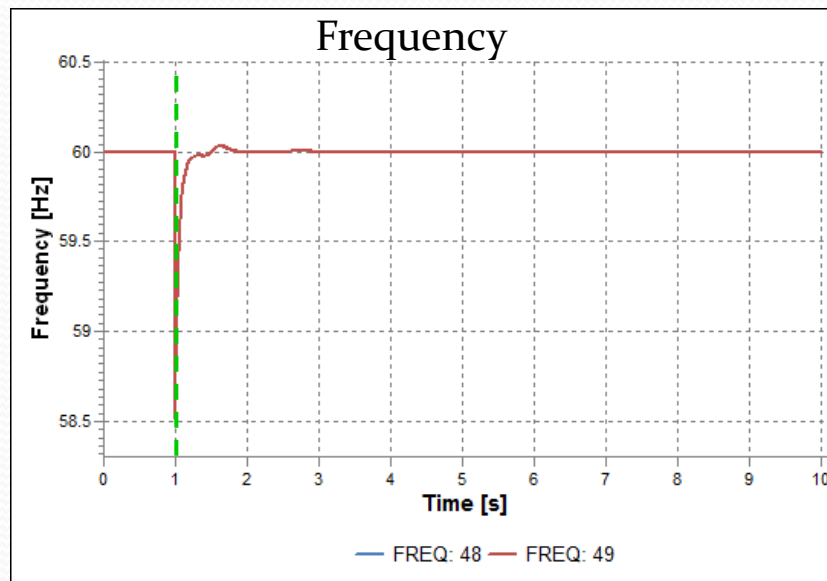
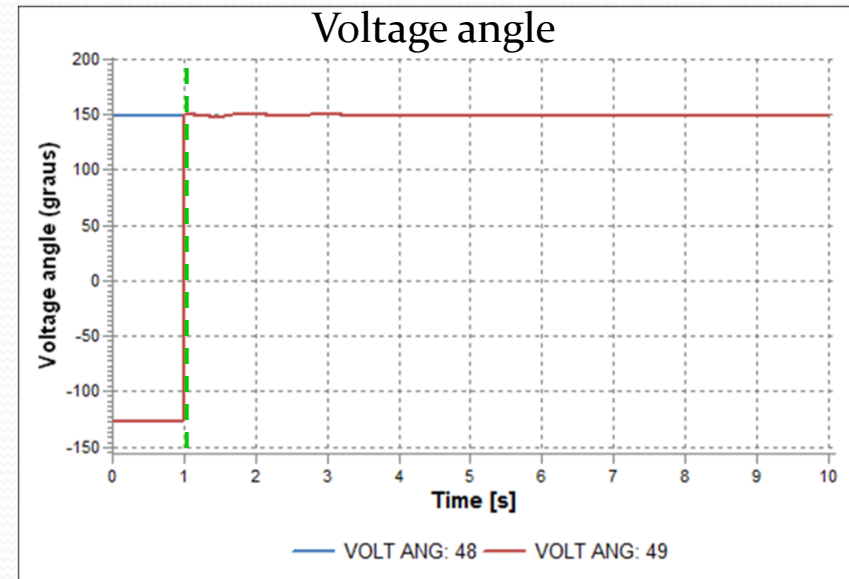
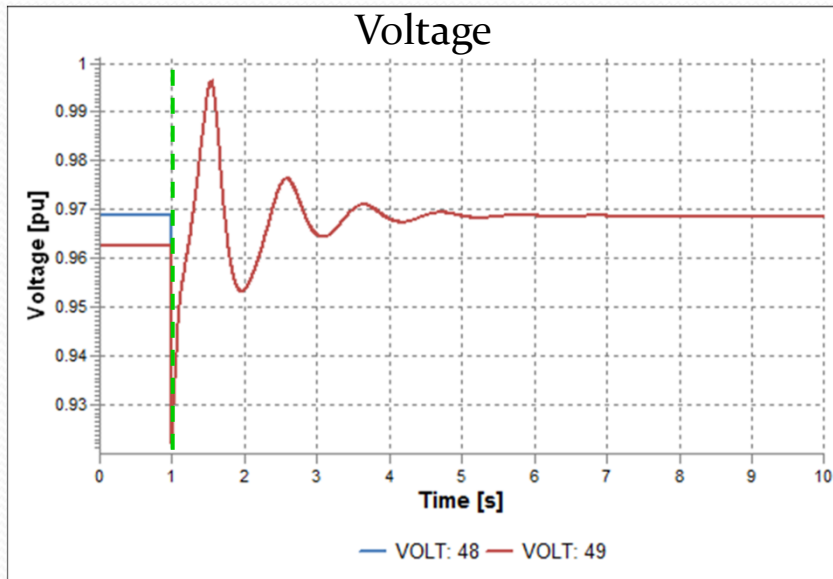
- Reconnecting the microgrid to the main grid

I) Forced circuit breaker closing

coupling circuit breaker

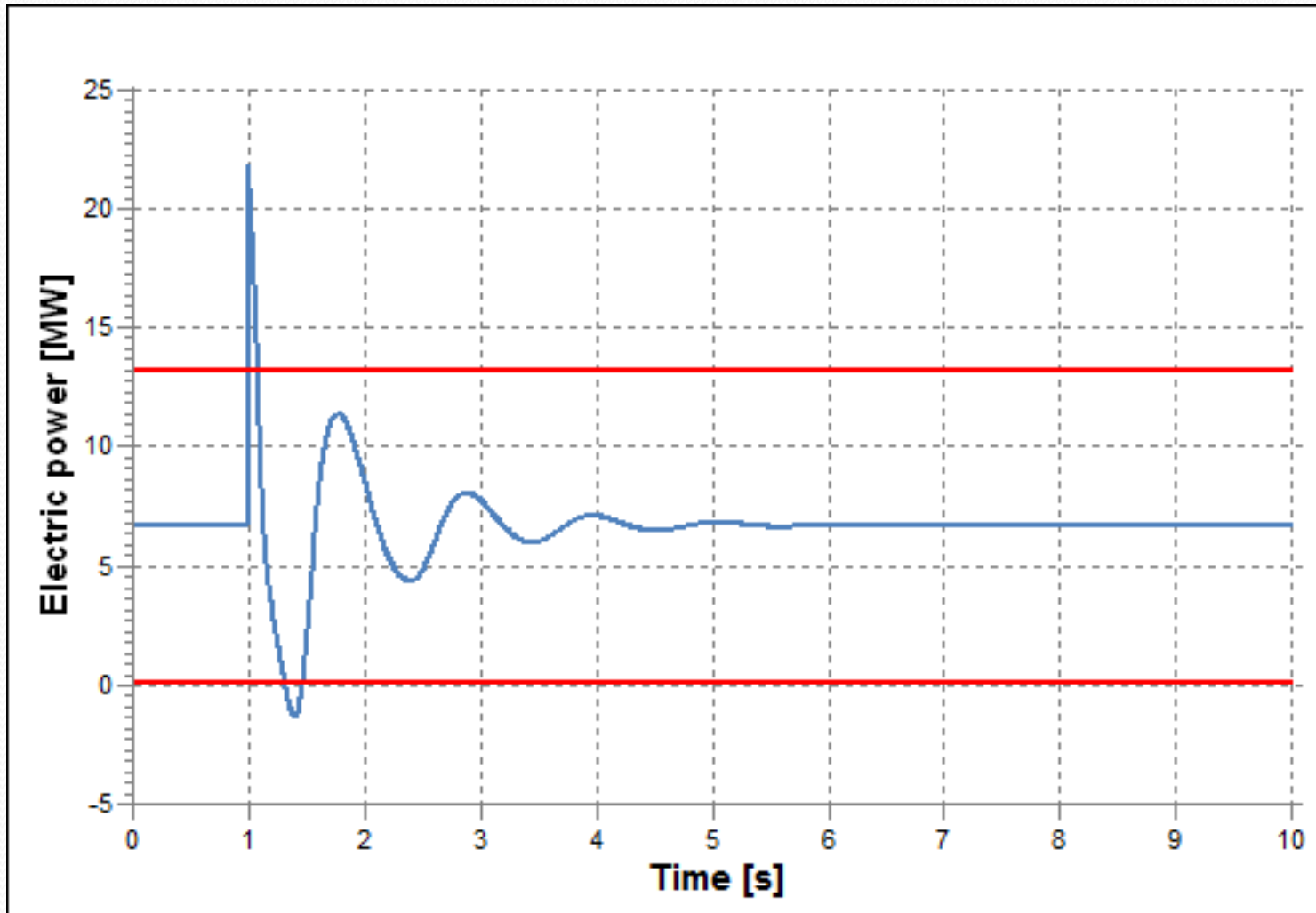


Measures at both sides of the coupling circuit breaker



microgrid
reconnection
1 S

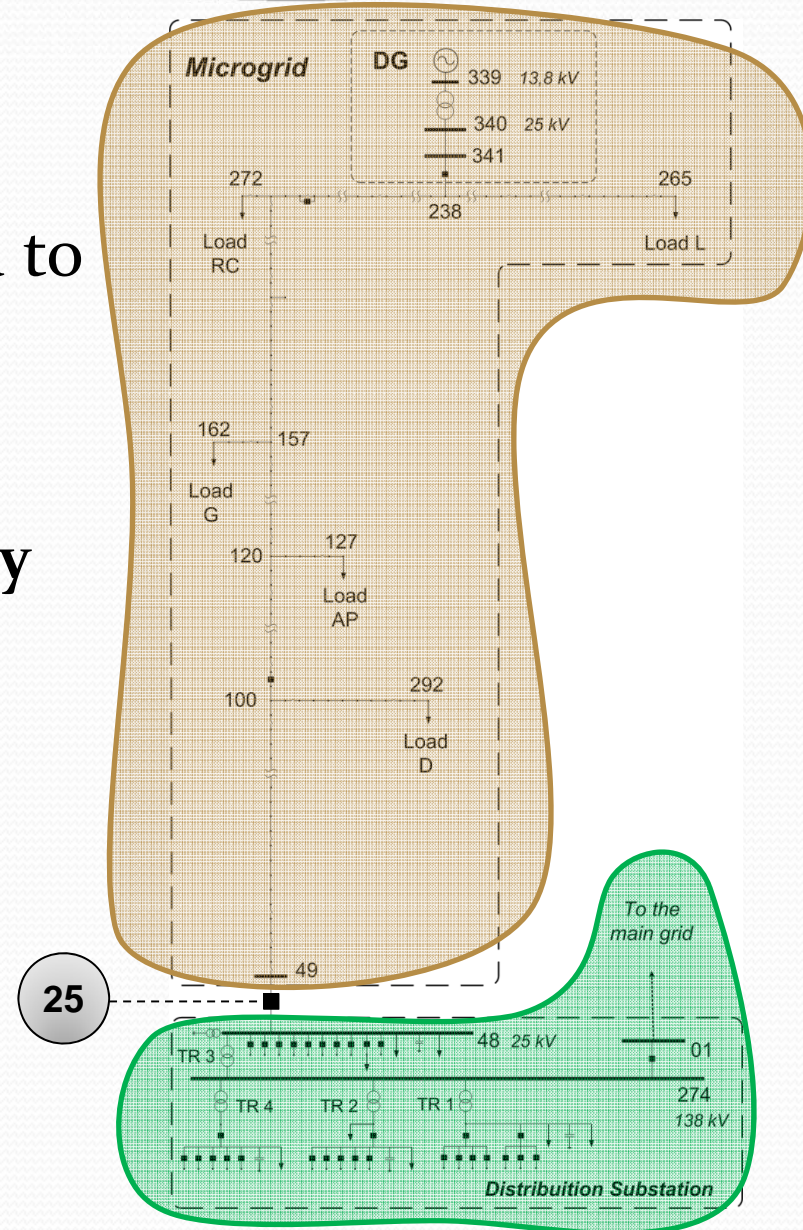
Torsional effort evaluation during the random reconnection



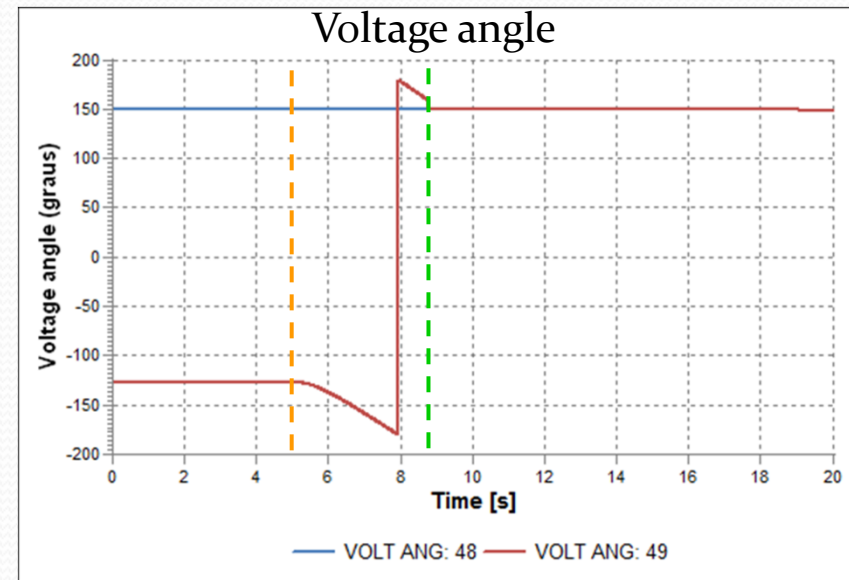
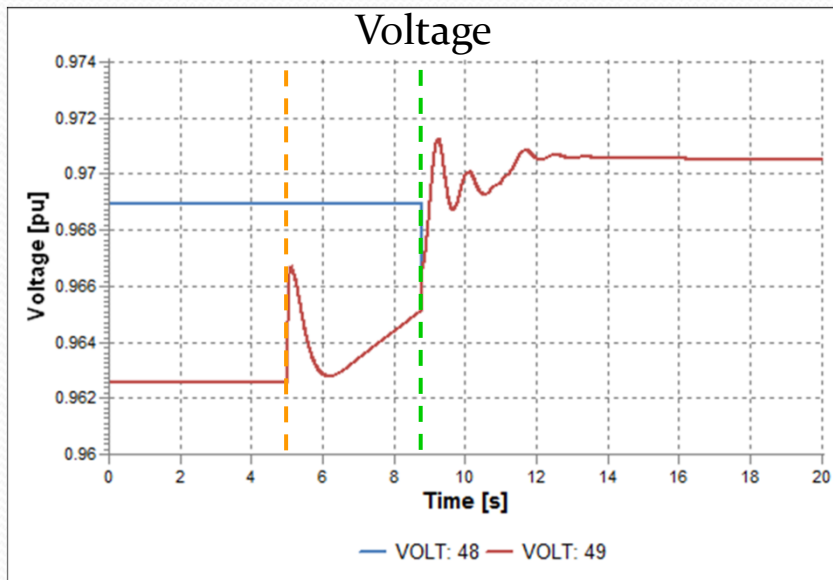
C) Reconnection

- Reconnecting the microgrid to the main grid

II) Synchronism check relay



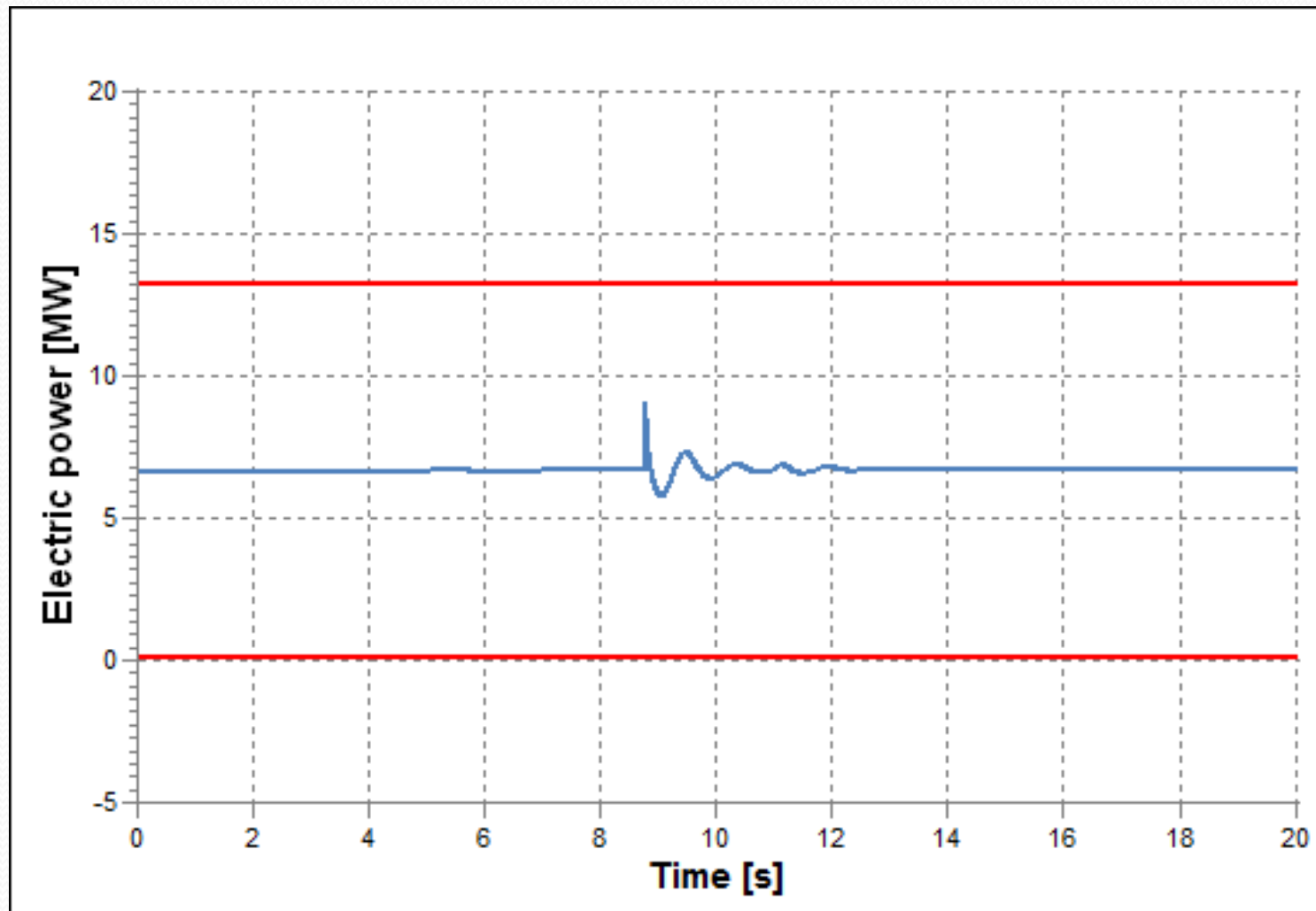
Measures at both sides of the coupling circuit breaker



additional
signal to
AVR

microgrid
reconnection
8,79 s

Torsional effort evaluation during controlled reconnection



III. Conclusion

- Increase of distributed generation
 - Potential to implement the intentional islanding
 - Benefits for the system
- The paper has analyzed a actual microgrid and the results have shown:
 - Success of islanding depends strongly on the balance of load x generation in microgrid at the time of islanding
 - The synchronized reconnection is important to avoid prohibitive mechanical stress