Development of a cyber-induced anomaly detector for Grid Connected Converters

Master Thesis
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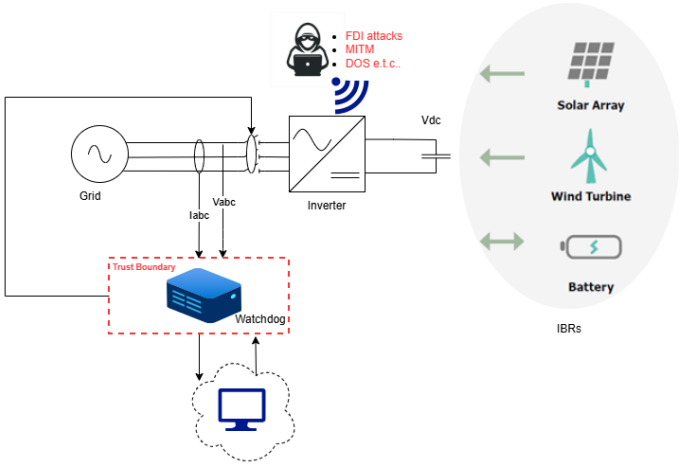
Grid-connected power converters are critical components of modern power systems and must operate reliably under changing grid conditions and potential faults or cyber-physical disturbances.

This thesis aims to develop an anomaly detection method for grid-connected converters based on electrical and/or control measurements. A key focus will be on the real-time implementability of the detector on a watchdog system, enabling the converter's operation to be continuously monitored for abnormal behavior.



1 Tasks

- Literature review on anomaly detection, fault detection, and cybersecurity of grid-connected converters.
- Development of a converter model in simulation, for example using Matlab or PLECS.
- Development of an anomaly detection algorithm, potentially using statistical methods, model-based approaches, signal analysis, or machine-learning techniques.
- Evaluation of the detector in terms of detection accuracy, false-alarm rate, detection time, and robustness to changing operating conditions.
- Experimental validation using a laboratory grid-connected converter setup.
- Analysis of the suitability of the proposed method for real-time implementation on an embedded controller.

2 Required SKills and Knowledge

- Knowledge of Power Electronics and control theory
- Basic understanding of the power grid (Distribution) and Grid Connected converters
- Embedded C/C++ skills
- PLECs, Simulink