TITLE: DESiRE	AUTHOR:
	DATE:

Object under Investigation (*OuI*)

The OuIs are as follows:
1. The control structure for BESS deployed for improving the operation of distribution networks.
2. The performance of the battery in the considered sce-nario with high PV and EV penetration.
3. Extension of CHIL/PHIL implementation to small RTDS setups.

Function(s) under Investigation (*FuI*)

The FuI are as follows:
1. The implementation of the control structure through a CHIL interface.
2. The verification of the battery performance through PHIL interface.

Domain under Investigation (*DuI*):

Test parameters: Network voltage levels, line loading, BESS response, BESS utilisation.
Connectivity: Protocol for CHIL, interface for PHIL, latency

Test Objectives

The test is needed in order to identify suitable CHIL and PHIL implementations which can be accommodated on a small RTDS setup. We expect to find out implementation challenges and solutions and to identify scope of verification experiments which can be carried out.

Purpose of Investigation *(PoI)*

The PoI is to characterise the BESS contribution in a medium-voltage distribution net-work, testing through real-time simulations on a restricted RTDS setup. Applicable CHIL and PHIL interfaces to increase the scope of the real-time tests will be investi-gated.

System under Test (*SuT*)

The SuT consists of a reference Distribution Network with high penetration of PVs and EVs. Three BESS units are deployed to improve the network voltages, losses and line loading. Distribution network is reduced while load/PV/EV and BESS modelling is simplified to fit model on 2-core RTDS system. Software model is enhanced with CHIL and PHIL inter-faces. CHIL serves to test controller for providing BESS power references. PHIL serves to allow validation of BESS hardware.

Functions under Test (*FuT*)

The FuT are the following:
- CHIL implementation options
- running CHIL tests on a restricted RTDS setup
- PHIL implementation options

Target metrics (*TM*)

Measures from the SuT:
- bus voltage levels, branch power flows
- BESS SOC profiles
- Battery dynamic response

Test criteria *(TCR)*

TCR:
- network performance in terms of voltage levels, losses and line loading
- latency for CHIL implementation
- congruence between full network model and modelled reduced system
- latency for PHIL implementation

Quality attributes *(QA)*

Pass/fail criteria: stability of the CHIL and PHIL loops, running of real-time model with CHIL on a 2-core system.
Test Result quality:
Latency in CHIL / PHIL implementation.

Variability attributes *(VA)*

Factors leading to VA for the SuT include:
- the network model reduction approach
- the implementation of the CHIL and PHIL interfaces
- the sequencing of the control algorithm.