Y9.HIL.1 Volt-Var Control Evaluation on HIL Testbed

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Overview

Objective:

- Adopt the previously developed framework for evaluating volt-var control in a comprehensive and automated manner on the HIL testbed
- Measure voltage deviation levels.
- Measure Power losses for implemented control system.

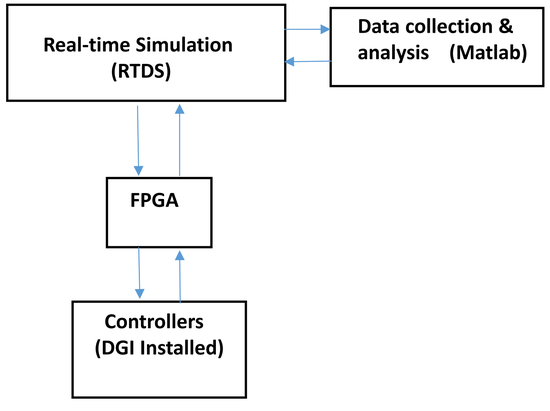
Technical Approach:

- Determine required parameters and their value range.
- Auto-create configurations for experiment using Matlab
- Generate sample space for system parameters satisfying value range constraints through Latin Hypercube sampling
- Apply recently developed high speed data sampling
  - Up to 64 variables bi-directional between real-time simulation and controllers
- Determine response quantities to be measured and define metrics that evaluate system performance
- Perform real time simulation of generated configurations
- Extract results and perform analysis

Method

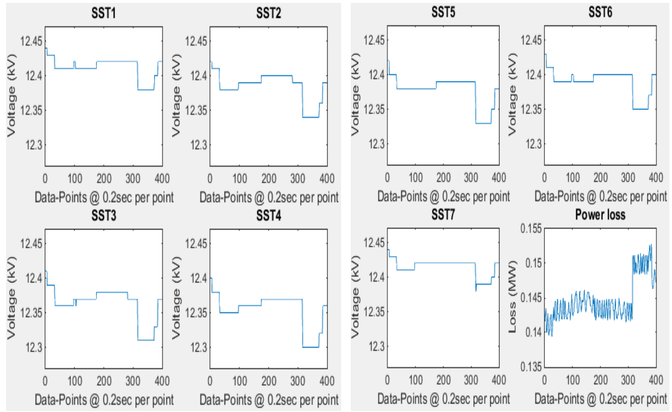
Model & Simulation:

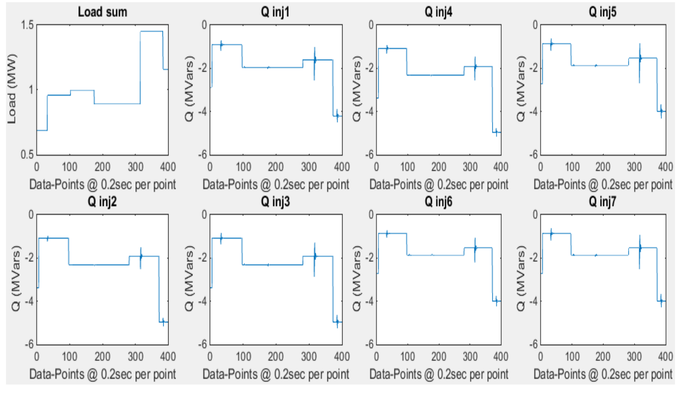
- Power system model for Volt-var control developed in RTDS
  - Seven SST's included in Model
  - Fault point simulated between SST's 2 & 3
  - DGI controls included in Model.
  - Multiple Load Profiles simulated.
  - Configuration of FPGA for bidirectional data transfer between simulation and controllers (up to 64 variables per direction)
  - Automated simulation start/stop function implemented with scripts
  - Automated data collection and analysis with Matlab
  - Measurement of voltage deviation levels with respect to load profile



Results

Initial Results



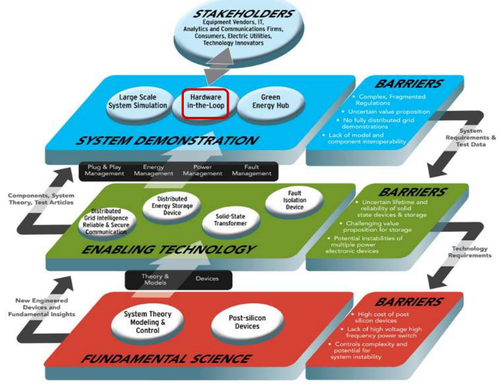


Future Work:

- Verify VVC performance on larger system models
- Test system competency for large scale bidirectional data transfer

References

1. Volt/var control algorithm for modern distribution management system by I. Roytelman, B. Wee, R.Lugtu.



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