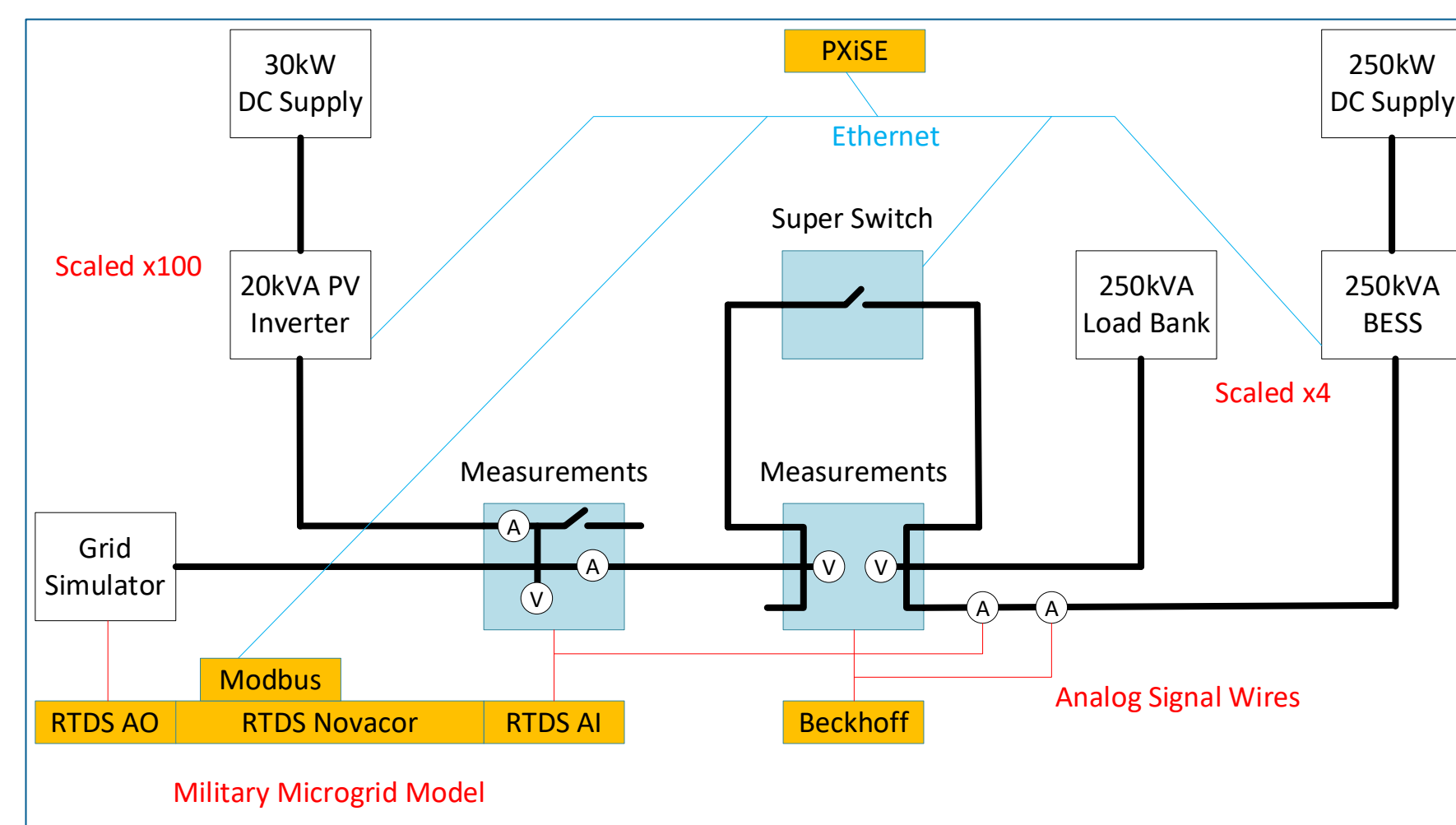


Hardware Demonstrations - Large Scale Energy Storage Microgrids

Singapore 2022 Symposium on Microgrids
 Demonstrations funded by ESTCP. Photos by Brian.Miller@NREL.gov

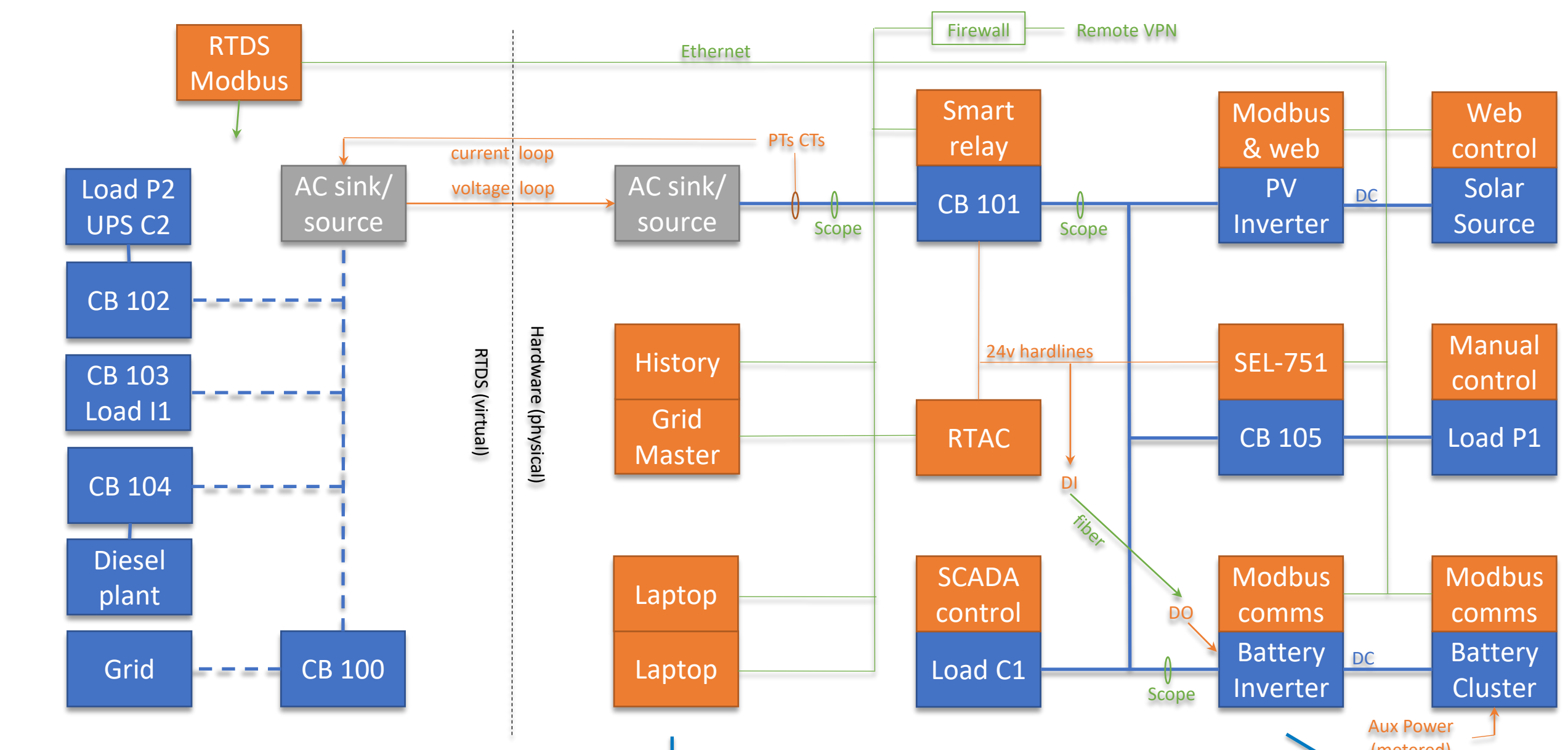
Hardware-in-the-Loop (HIL)



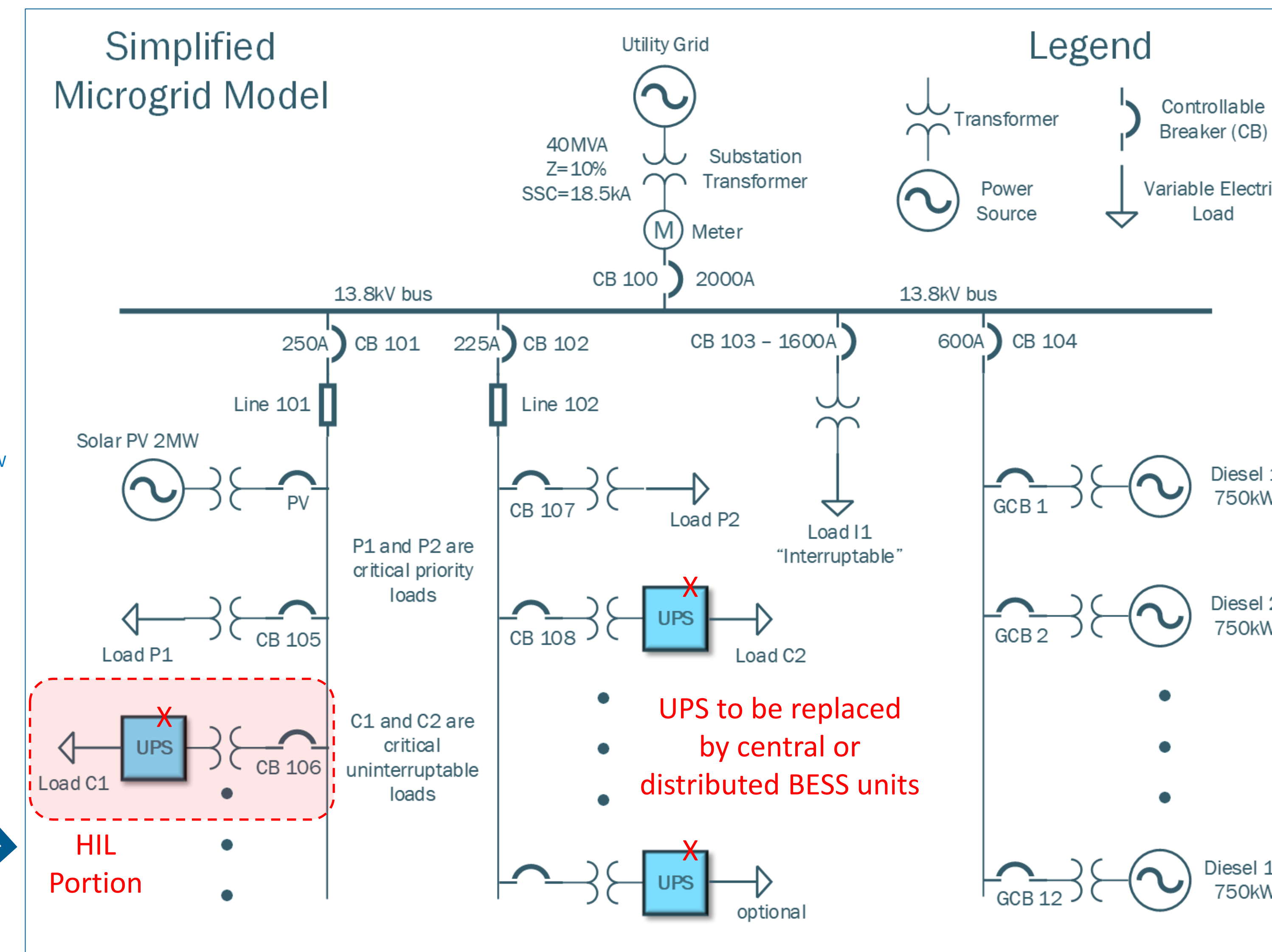
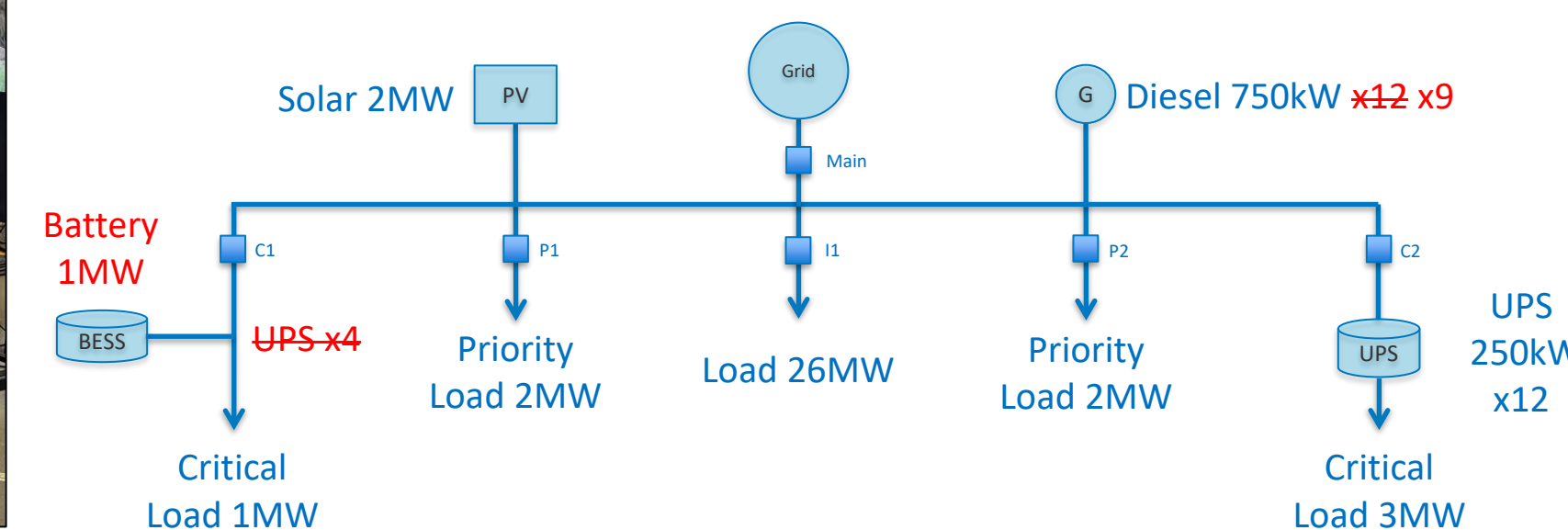
OBJECTIVE

Analyze energy storage to increase reliability and resilience, then validate the analysis in an actual hardware demonstration to prove performance.

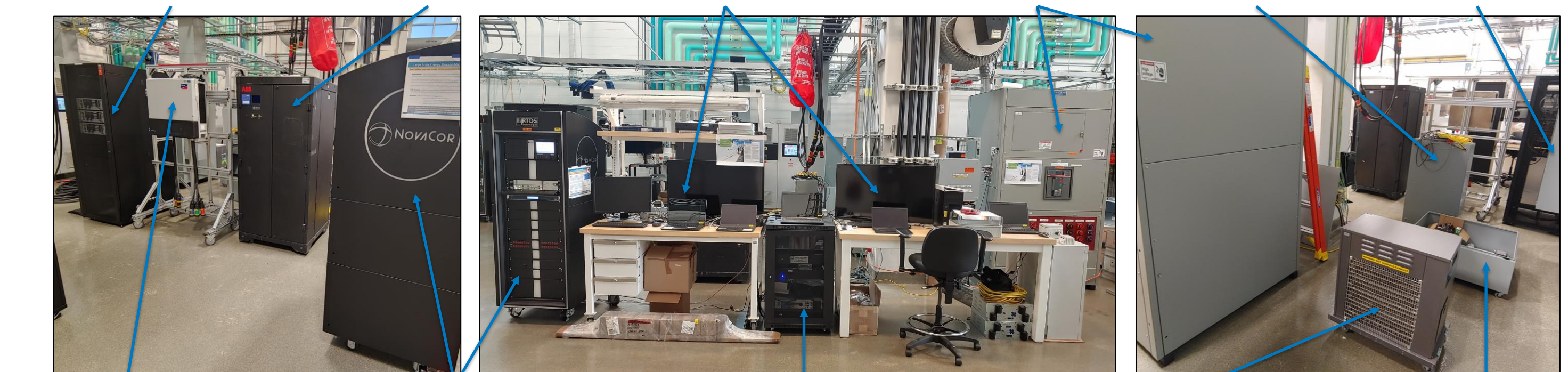
Controller HIL + Power HIL + Communications Equipment Setup



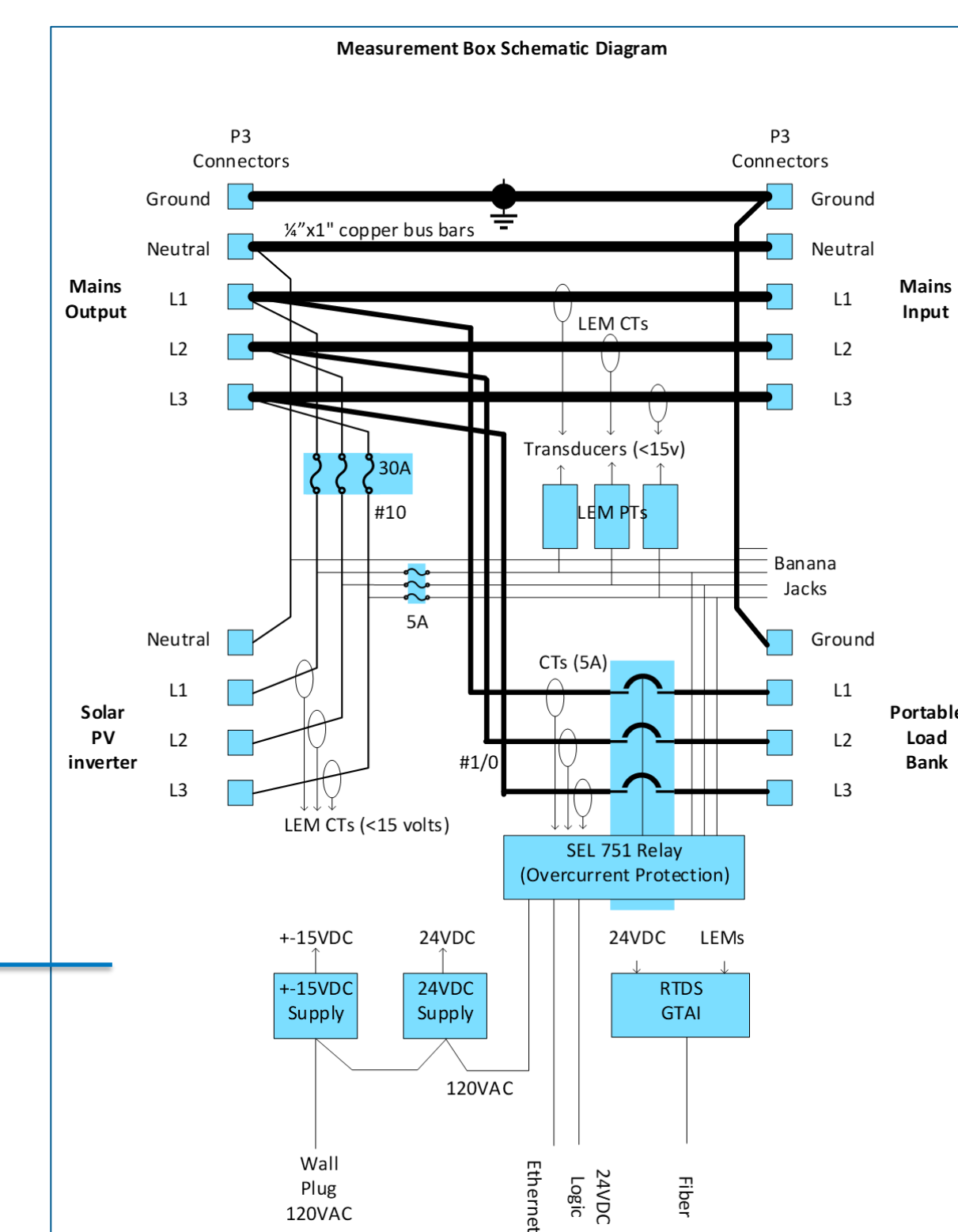
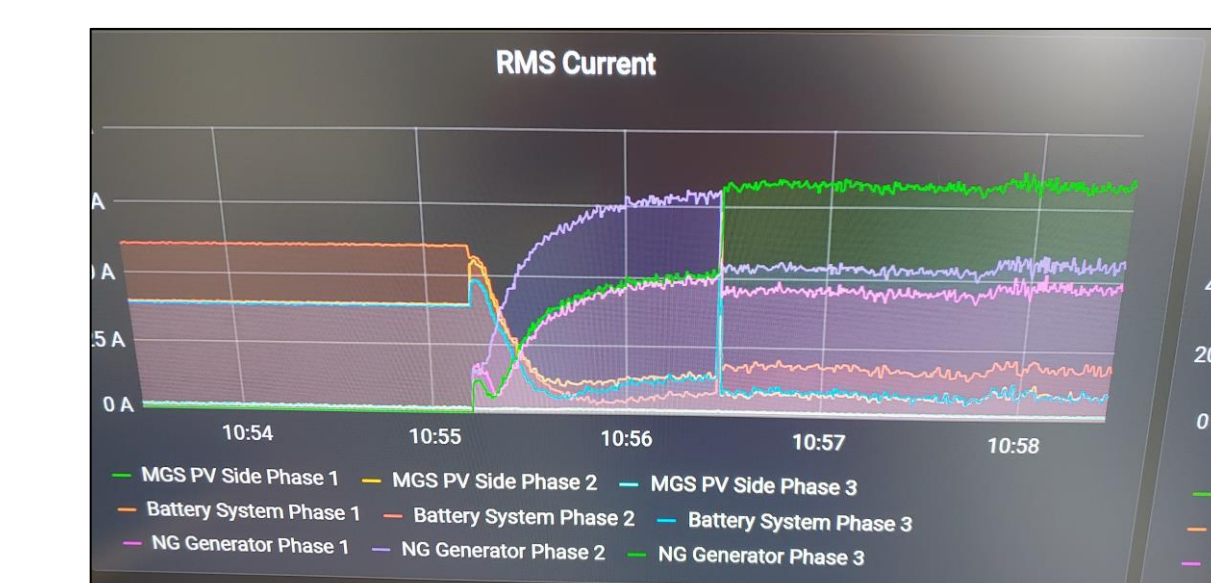
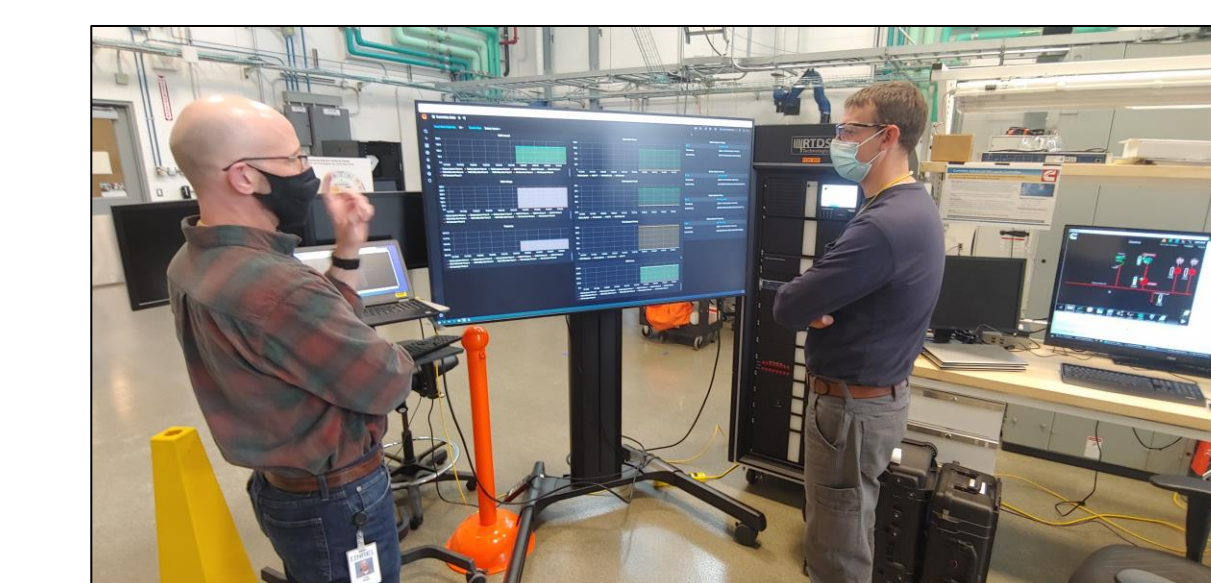
Replace UPS with BESS



Programmable PV Supply Solid-State Switch Workspaces with Networks for Partners Microgrid Switch Microgrid Controllers EPC Power Inverter



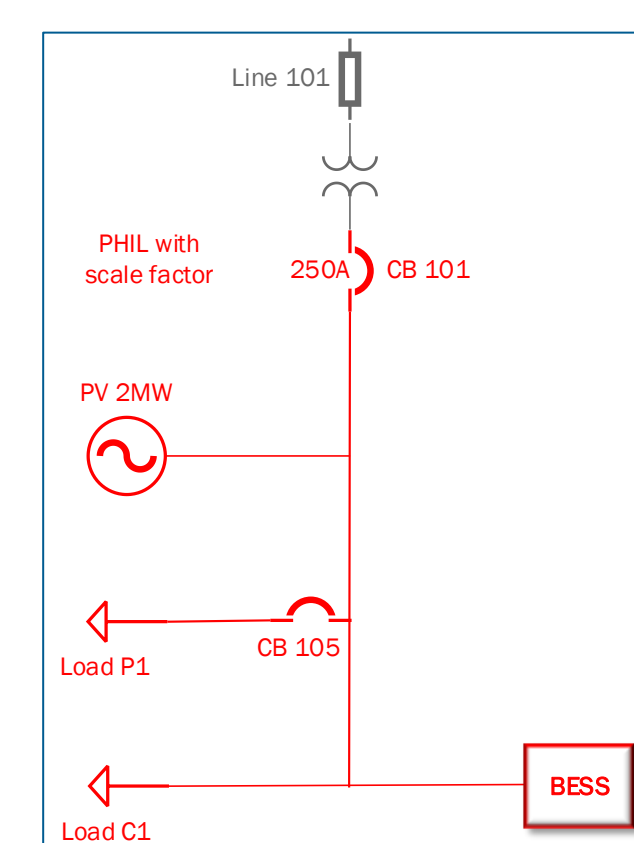
Live Data Visualization



Dynapower Inverter and Samsung Lithium Batteries



CE+T Inverter and Invinity Flow Batteries



Option: Replace Entire Feeder with Solar + Storage HIL

OR

Option: Replace UPS with BESS and Solid-State Switch HIL; Some Gensets Become Unnecessary



Outcomes of Research

- Inverter mode change:
 - Not fast enough for UPS
 - Dynamic droop = success
- Source dispatch priority:
 - BESS takes genset role
 - Survivable duration rose

ACKNOWLEDGEMENTS

