모델기반 설계를 활용한
Micro-Grid Test Bench 구축

㈜위드비어 기술연구소
한대수 책임연구원

2023. 07. 04.

WithBEER

With Best Engineering & Essential Responsibility

TABLE OF CONTENTS

I

Company overview

01 일반 현황

02 사업 및 서비스영역

WithBEER Co., Ltd.

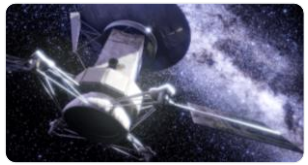
1. 일반 현황

회 사 명	㈜위드비어 WithBEER Co., Ltd (With Best Engineering & Essential Responsibility)
설 립 일	2020년 5월
대표이사	오 형 록
임직원수	6명 (2023년 06월 기준)
회사위치	전라남도 나주시 교육길 13, 스마트파크지식산업센터 F동 209호
홈페이지	https://withbeer.co.kr

핵심역량

- 실시간 시뮬레이터
  - Speedgoat : 판매, 용역, 기술지원
  - OPAL-RT : 용역 및 기술지원(유료서비스)
- RCP(Rapid Control Prototyping)
  - Speedgoat 및 PI-Innovo
- 신재생에너지 시험 및 개발기기 제작
- 4상한 동작 전력 시뮬레이터
  (EGSTONE Power Electronics / Austria)
- 서비스
  - 실시간 시뮬레이션 분야 유지보수 및 기술지원, 교육






2. 사업 및 서비스영역 (1)

제품

01 시스템구축

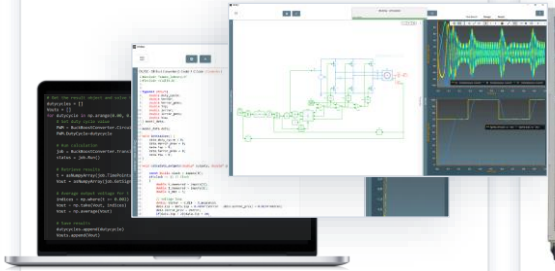
Speedgoat RT-Simulator & RCP

Pi-Innovo OpenECU

- Speedgoat
- HIL / P-HIL system integration for grid connected and EV application
- Including strong technical support
- H/W based Controller HIL System

02 시뮬레이션

- MATLAB/Simulink Based Power System & Power Electronics Modeling
- Siemens Simcenter AMESIM : Multi-Physics Modeling (플렌트모델링)
- SIMBA : Power Electronics & Motor Control Simulation
- Python API 제공



03 계통시뮬레이터

EGSTON Power Electronics

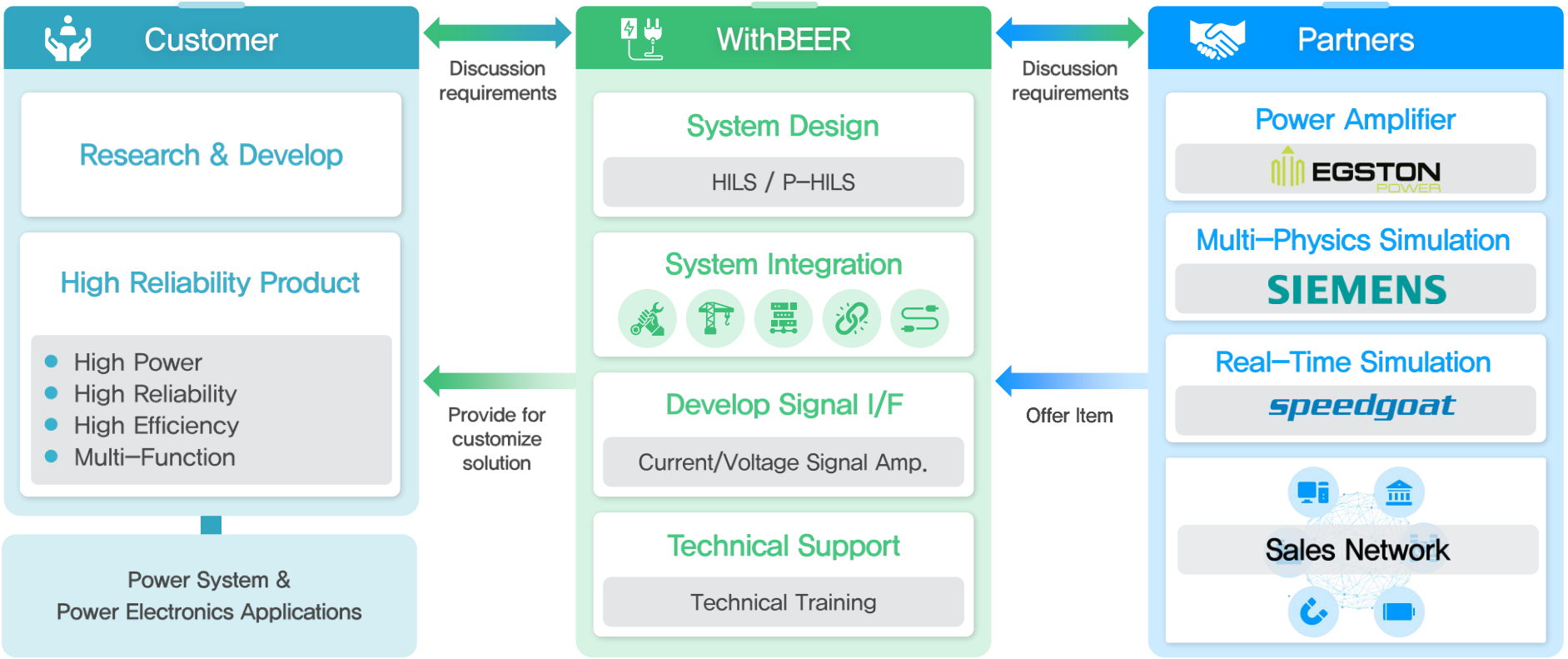
- 4Q amplifier for grid source, EV(Motor, Battery), PV, Wind….
- P-HIL application
- Including strong technical support

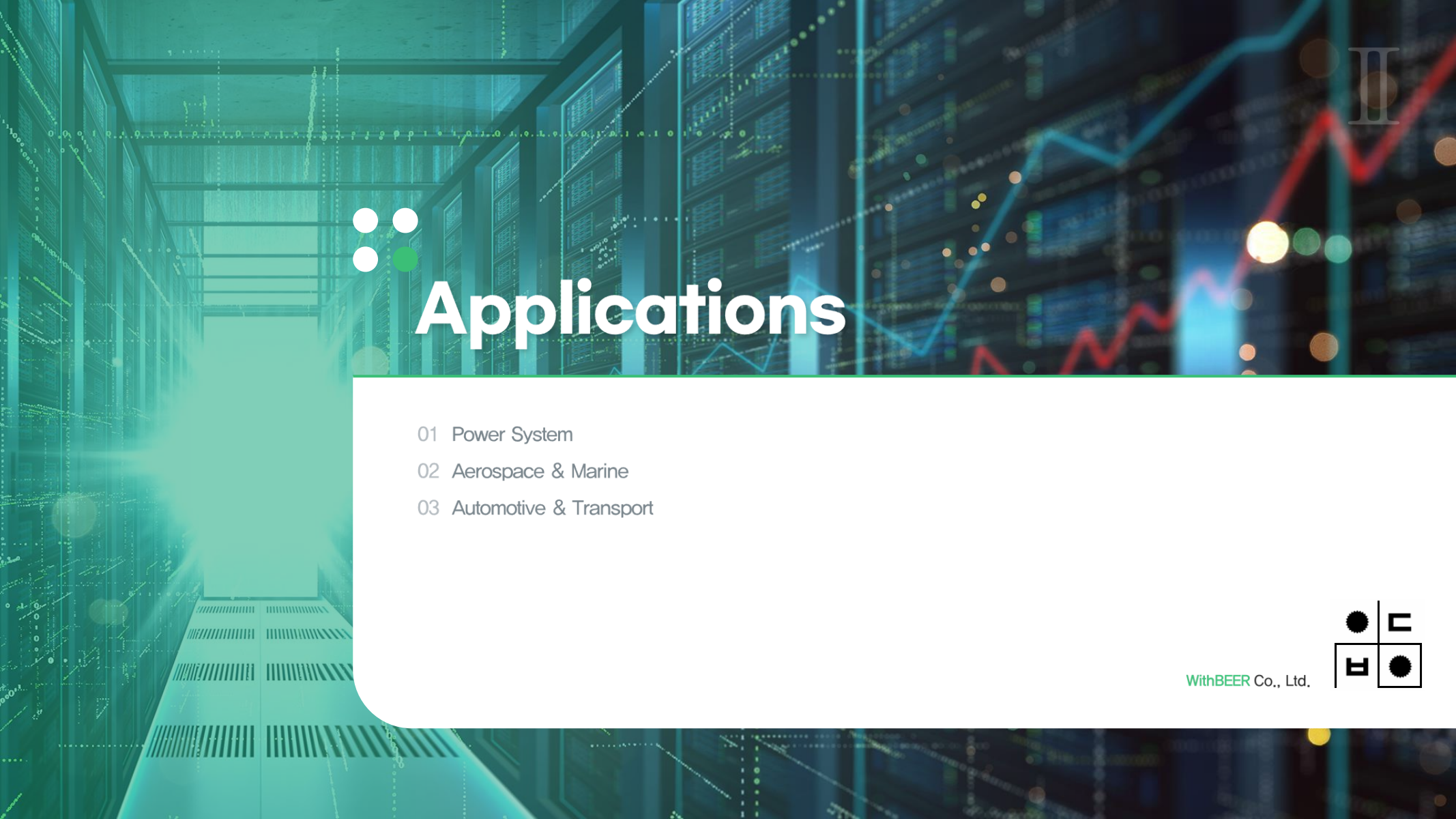
04 기타 에너지 시험장치

…

- Signal Amplifier : Current(5Arms)*4Ch / Voltage(110Vrms)*4Ch(Max 1.2kW)
- Grid measurement or control application like PMU, IED
- Including strong technical support

2. 사업 및 서비스영역 (2)


Customer
Research & Develop
High Reliability Product
High Power
High Reliability
High Efficiency
Multi-Function
Power System &
Power Electronics Applications
Discussion requirements
Provide for customize solution
WithBEER
System Design
HILS / P-HILS
System Integration
Develop Signal I/F
Current/Voltage Signal Amp.
Technical Support
Technical Training
Discussion requirements
Offer Item
Partners
Power Amplifier
EGSTON POWER
Multi-Physics Simulation
SIEMENS
Real-Time Simulation
speedgoat
Sales Network



Applications

01 Power System

02 Aerospace & Marine

03 Automotive & Transport

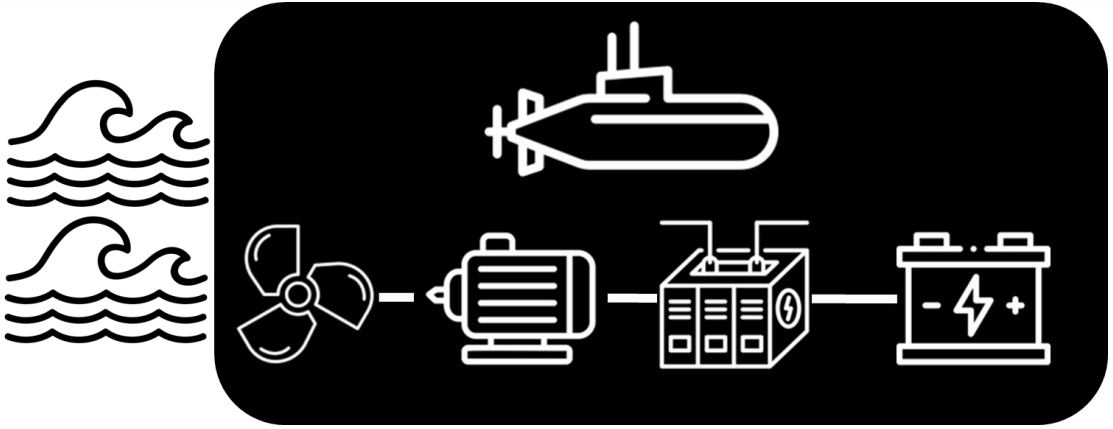
WithBEER Co., Ltd.

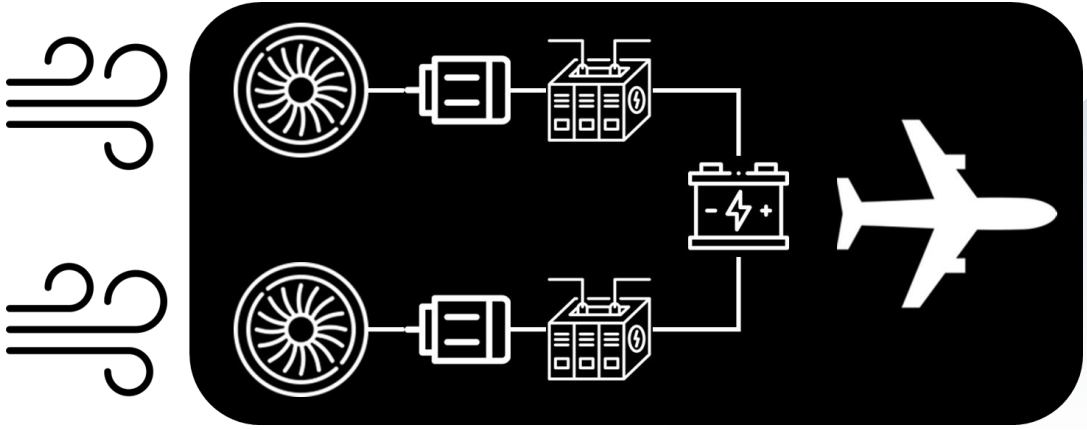
1. Power System

- Smart / Microgrid
- Grid Emulator(50, 60, 400 Hz)
- Grid Load
- PV-Inverter Testbench
- Wind-Generator Emulation
- UPS Emulation
- Grid Motor / Generator Emulation
- Inverter Emulator

2. Aerospace & Marin

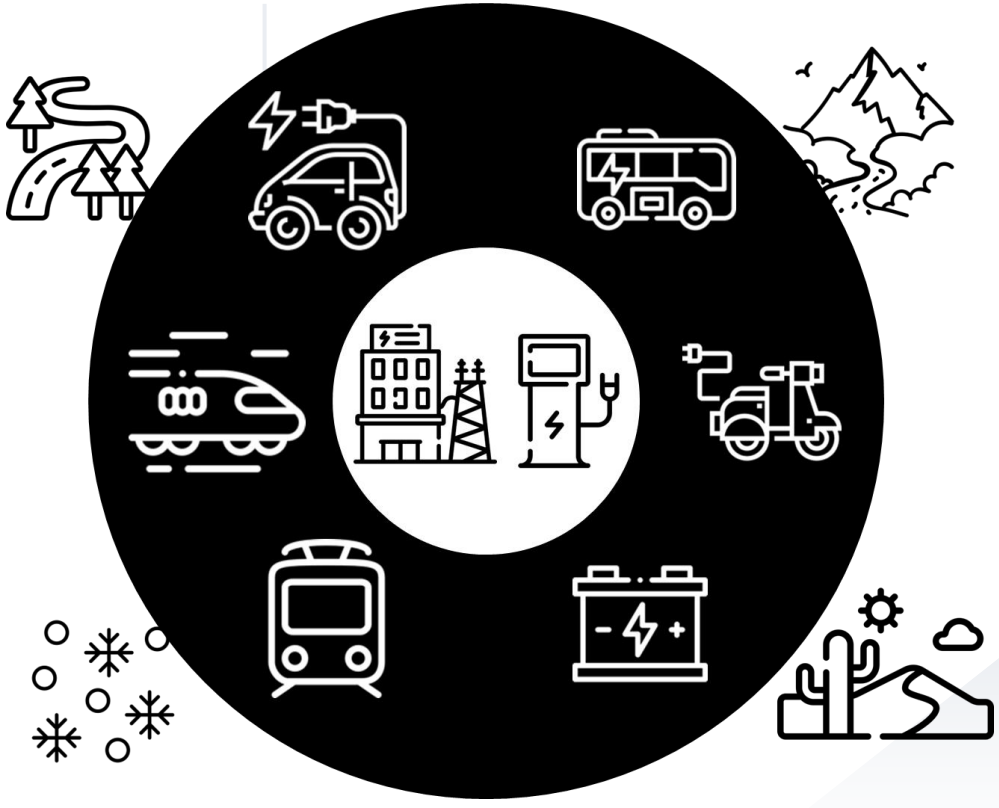
- Electric Ship
- Aerospace
- 400 Hz Supply Grid Emulator
- DC–Supply emulation
- 400 Hz Aerospace device emulator
- AC–DC Coupling Emulator
- Generator / Motor Emulator
- 400 Hz Inverter Emulator





3. Automotive & Transport

- Battery Emulator
- Drive Inverter Emulator
- Motor Emulator
- EV charging station emulator
- Test Bench for charging
- Grid Emulator
- Machine Emulator
- Inverter Emulator



II

Model Based Micro-Grid Test Bench

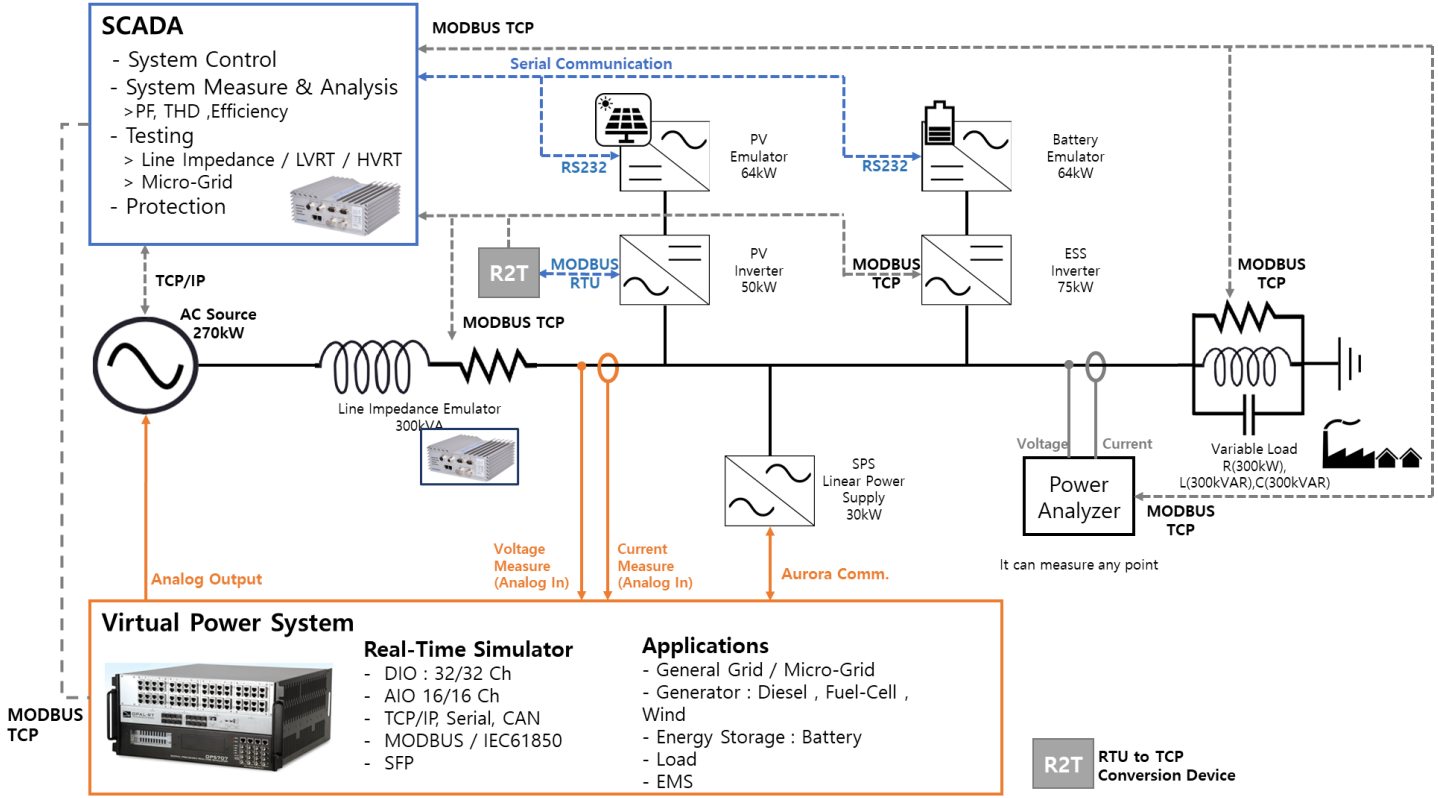
WithBEER Co., Ltd.

1. Project Overview

사 업 명	모로코 녹색기술 연구개발 종합지원사업
사업 목적	모로코 녹색기술(그린빌딩 및 물에너지 넥서스) 연구개발 플랫폼 구축 지원
사업 내용	그린빌딩파크 메인연구동 구축지원, R&D 역량강화, 물에너지파크 마스터플랜 수립 등
사업 구성	건축 / **기자재(참여)** / 전문가파견 / 역량강화 / 스마트그리드 구축 / 사업관리
사업 장소	모로코 벤게리르 그린에너지파크(IRESEN)
주관 기관	한국국제협력단 [KOICA]
수행 기관	▣ (PMC) (재)한국건설생활환경시험연구원 오창 ▣ (기자재) 주식회사아성텍 ▣ (기자재) 데스틴파워(주) ▣ (건설사업관리) 주식회사 정림건축종합건축사사무소 ▣ (건설사업관리) (주)토펙엔지니어링건축사사무소
참여 내용	1. 전체시스템 구성 설계 및 구축 2. SCADA System 구축 3. Power HILS 구축 4. 교육 : SCADA / Power HILS 5. 기술지원

2. System Configurations

300kW급 Micro-Grid Test Bench Configuration



Micro-Grid Test Bench (실제 설치 사진)

*KOICA ODA 사업『모로코 녹색기술 연구개발 종합지원사업』

300kW급 Micro-Grid Test Bench 구성 장비

ESS Emulator
(병렬: 64kW / 직렬: 1200kW)

ESS PCS (80kW)

PV PCS (50kW)

PV Emulator
(병렬: 64kW / 직렬: 1200kW)

실시간 시뮬레이터
& 센서박스

SpeedGoat Baseline
(SCADA System)

2. System Configurations

300kW급 Micro-Grid Test Bench 구성 장비

Power Change System

Line Impedance (300kW)

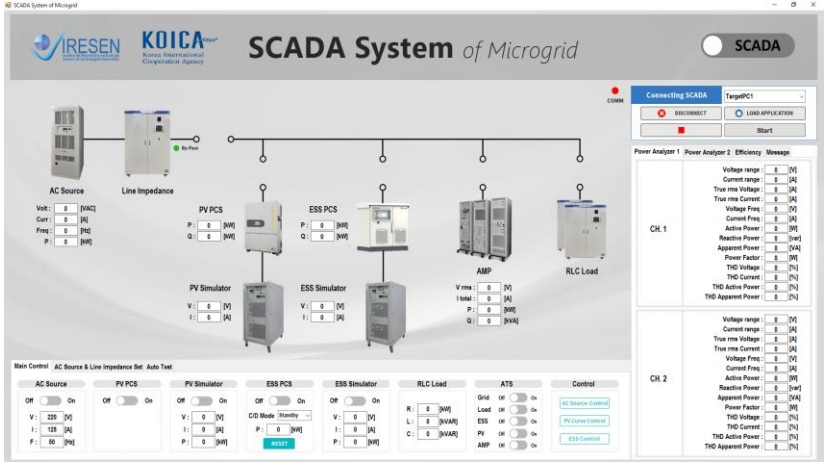
RLC Load (300kW)

Power Amplifier (30kW)

AC Source (270kW)
Power Analyzer
Oscilloscope

SCADA System 구성

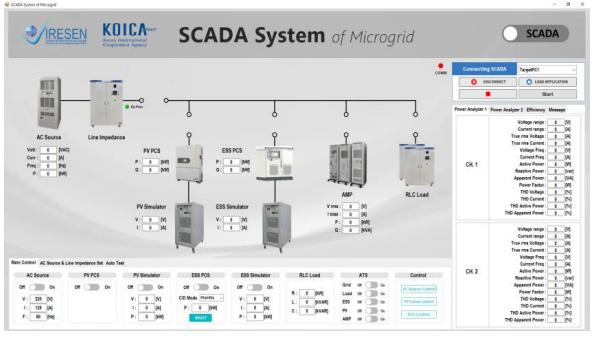
- Purpose : Test Bench Control
- Software
  - Modeling Software [Modeling & Simulation]
    - MATLAB(ML) / Simulink (SL) / Control system toolbox (CT)
    - Matlab Coder(ME) / Simscape (SS) / Simscape Electrical (PS)
    - Simulink Coder(RT) / Simulink Real-Time
- Hardware
  - Speedgoat Baseline
    - Intel Celeron 2 GHz 4 cores / 4GB DDR3 RAM / 32 GB SSD
- Communication
  - TCP/IP : AC Source (AMETEK RS270)
  - Serial : REGATRON (PV & Battery)
  - MODBUS TCP
    - RLC Load, Line Impedance, Power Change System
    - PV PCS, ESS PCS, Power Analyzer
    - OPAL-RT

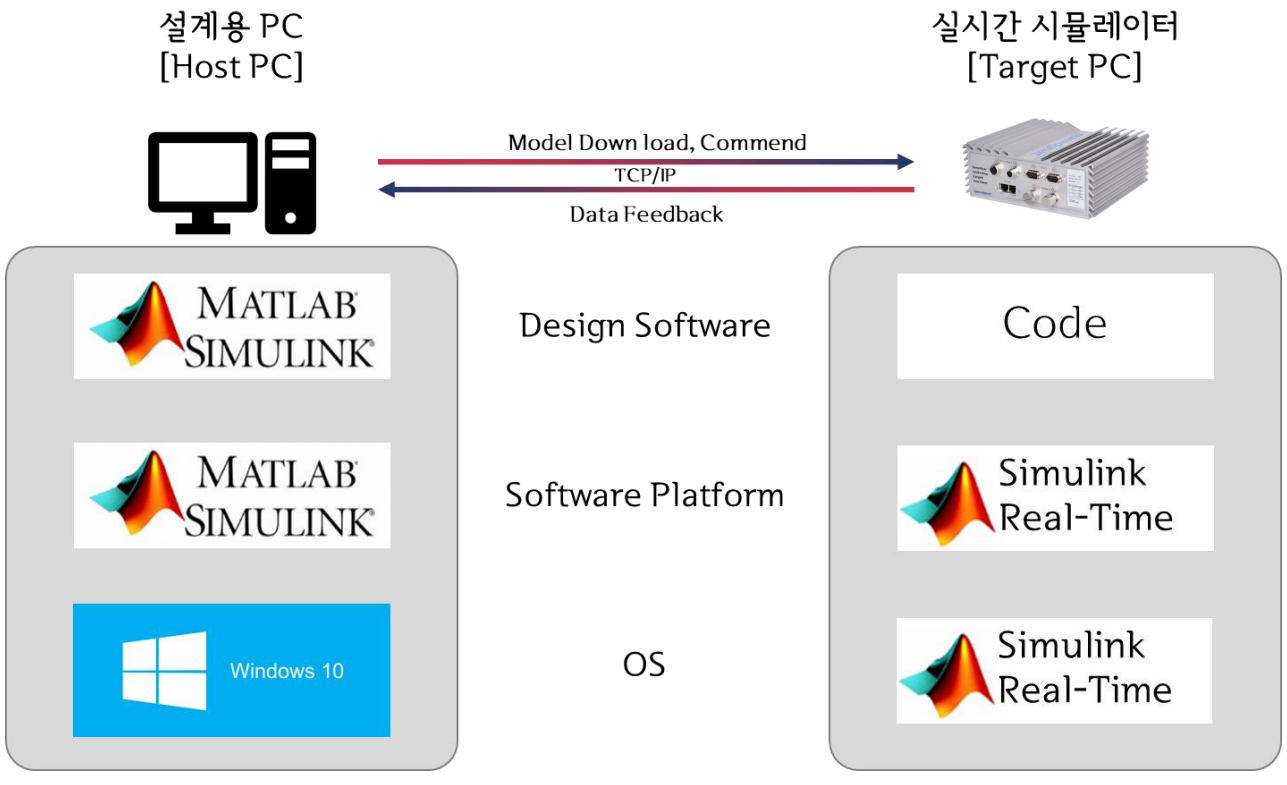


SCADA System UI [직관적]

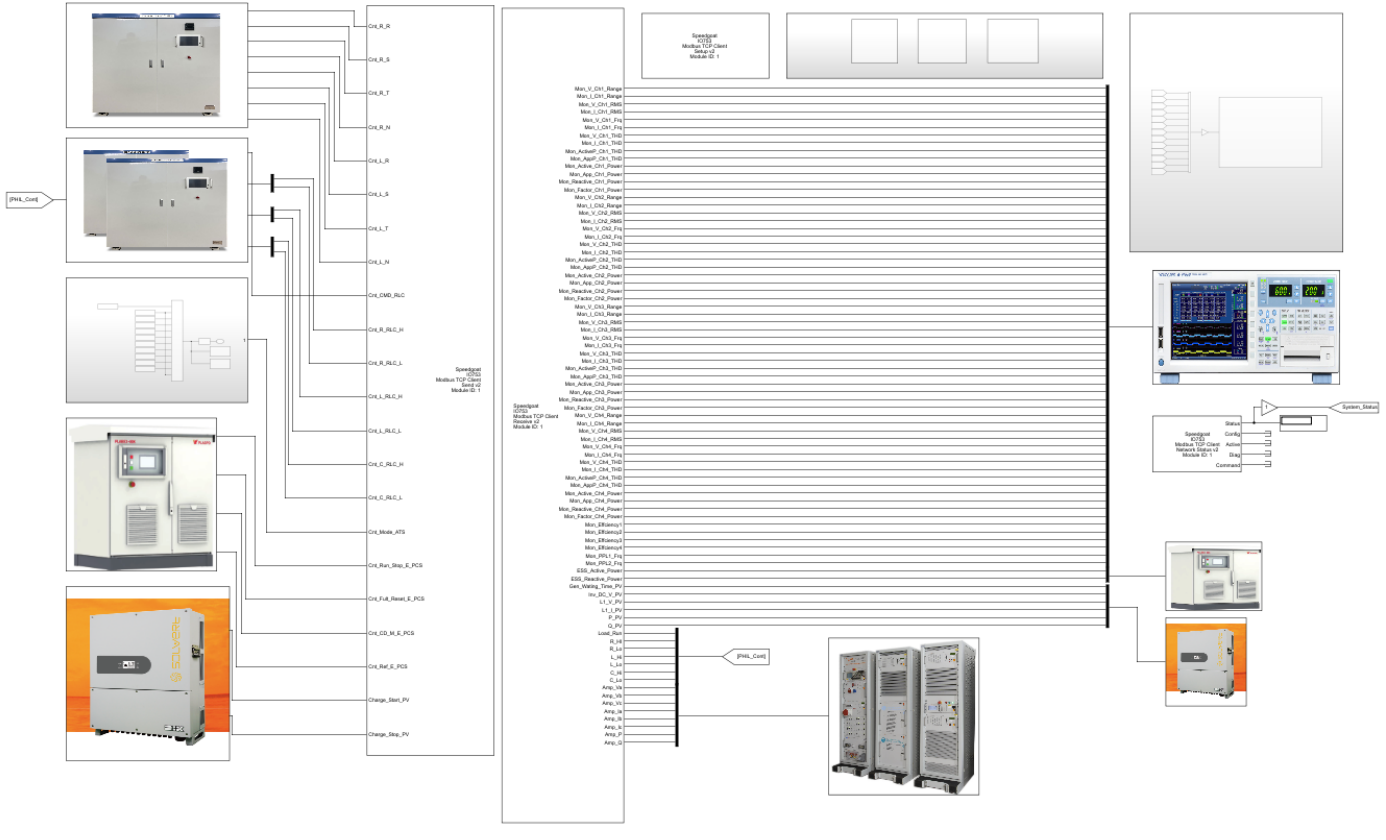
SCADA System 시스템 구성

UI App 또는 API(C#) 이용

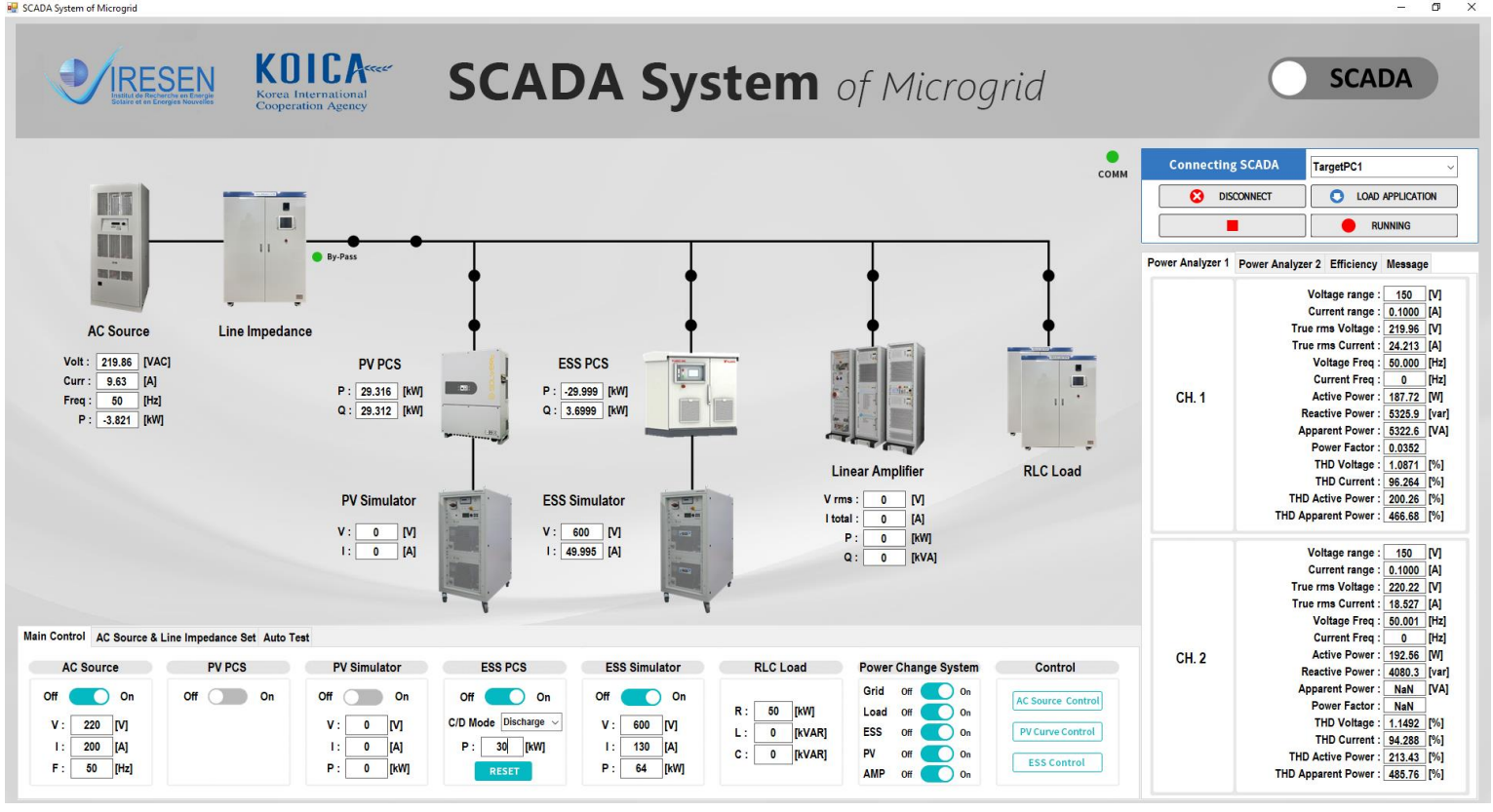




SCADA System 모델 구성

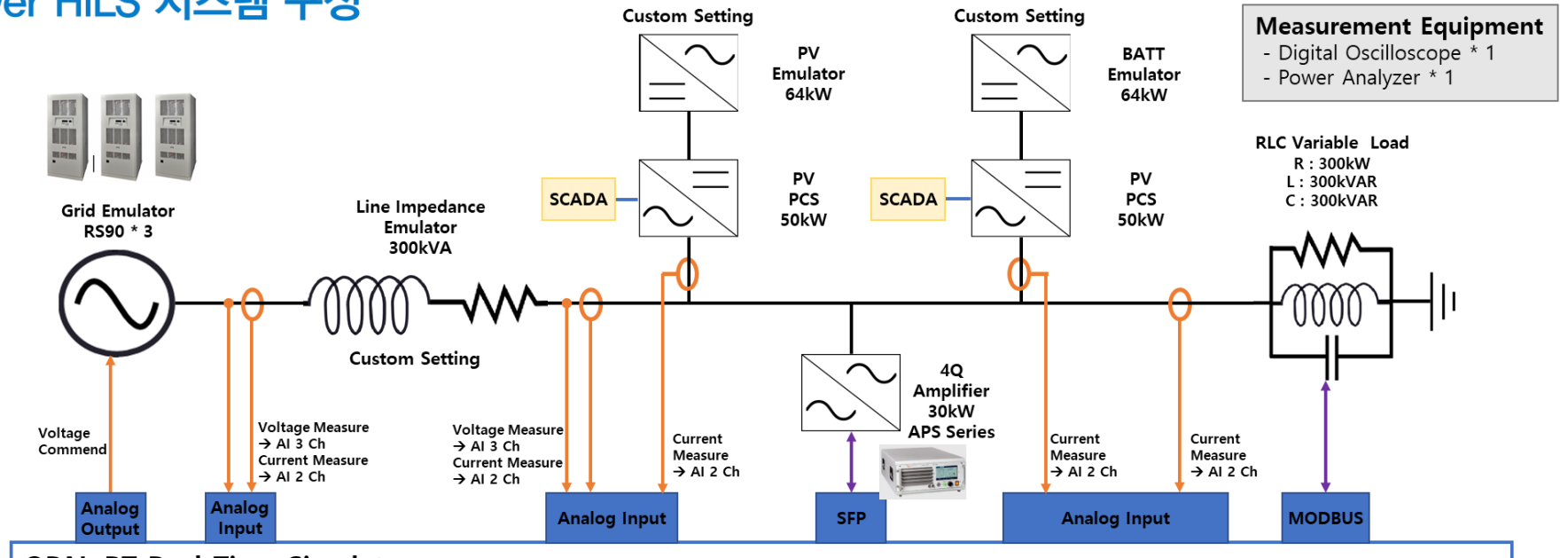


SCADA System 제어 및 모니터링 UI

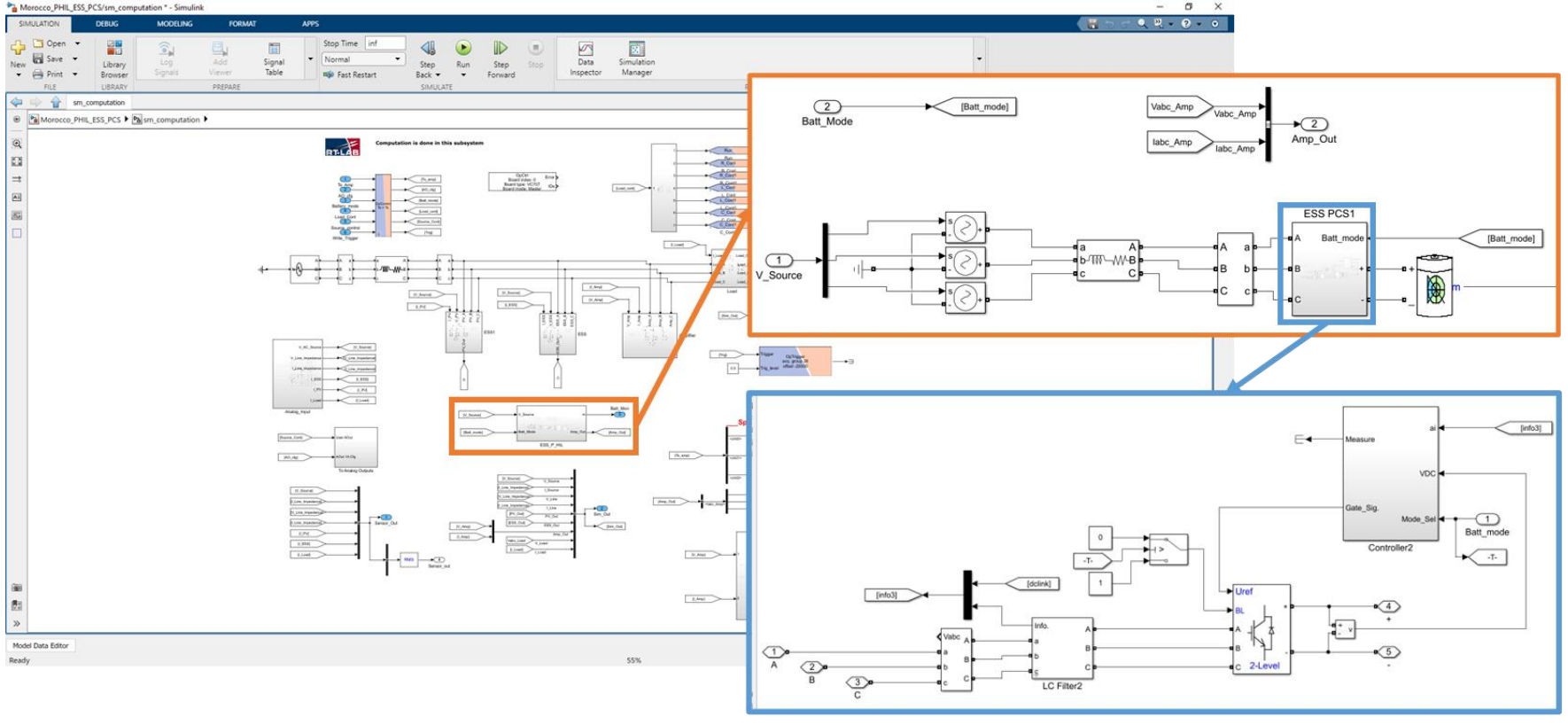


4. P-HILS System Configuration

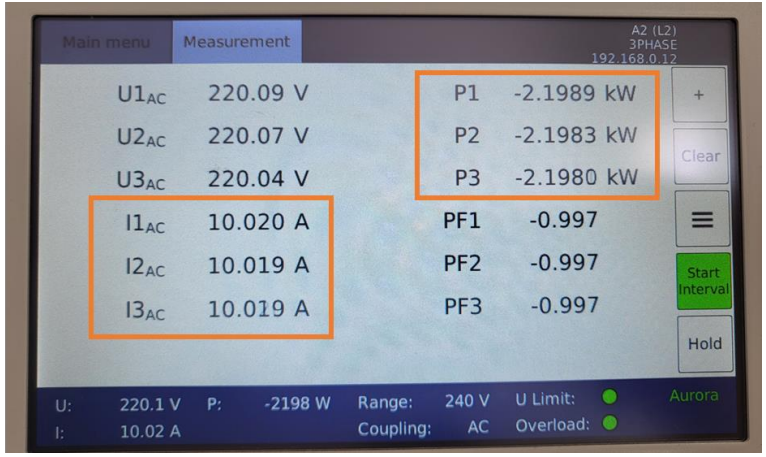
Power HILS 시스템 구성

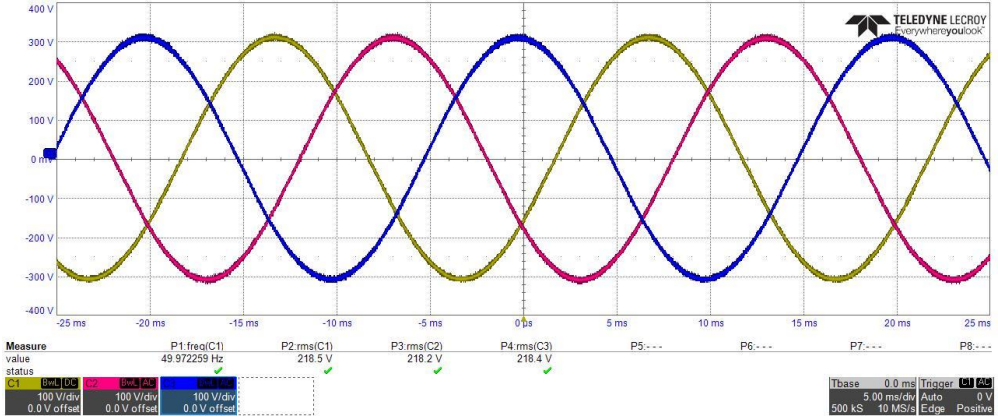


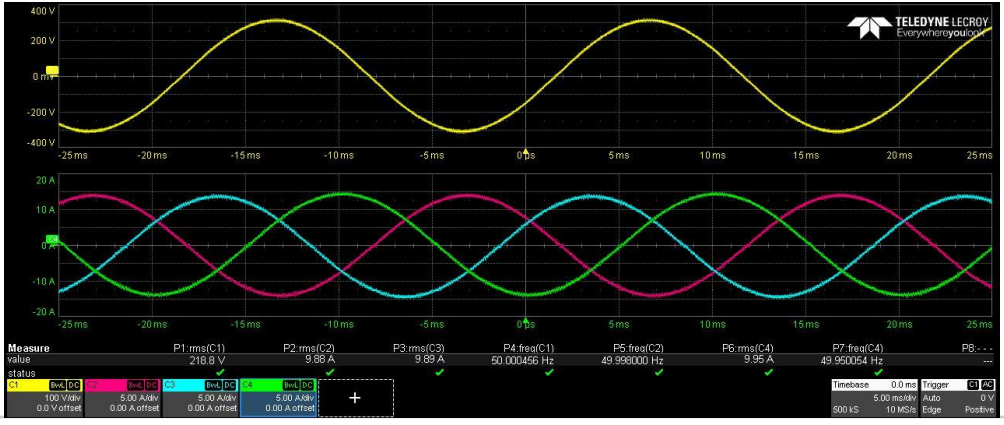
ESS Emulation Power HILS Test 모델



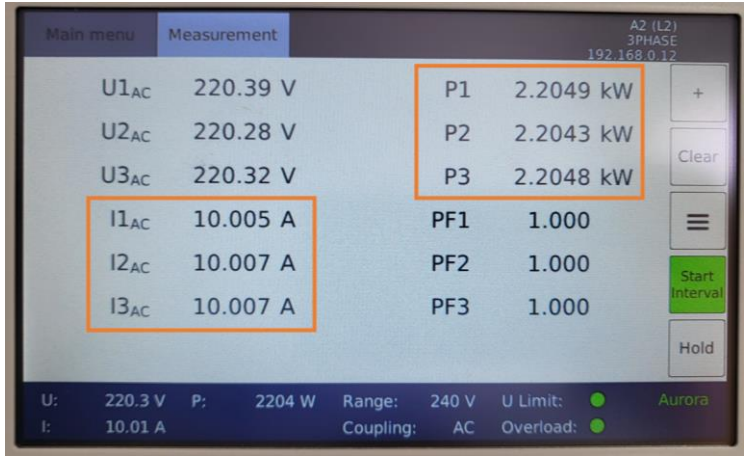
ESS Emulation Power HILS Test [Charging Mode]

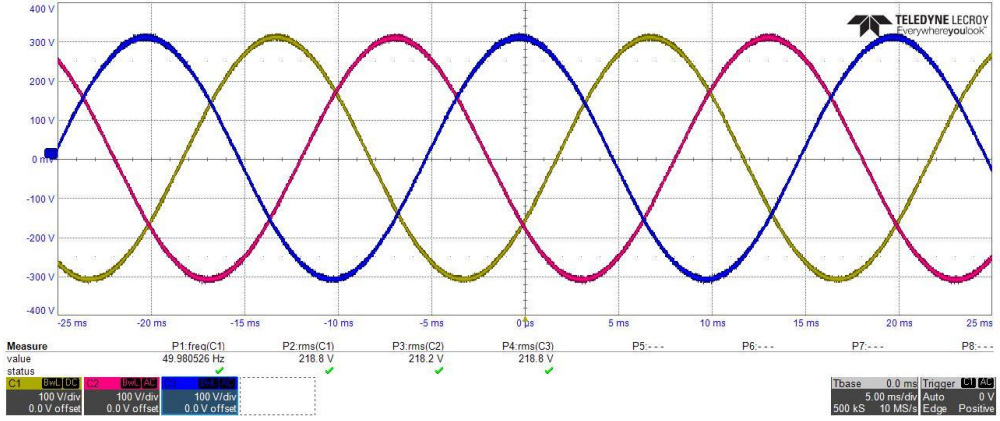


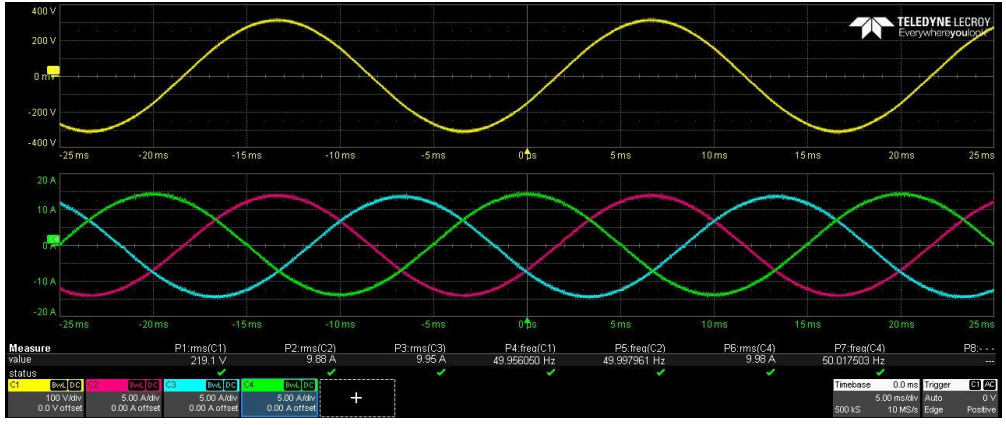




ESS Emulation Power HILS Test [Discharging Mode]







Q & A