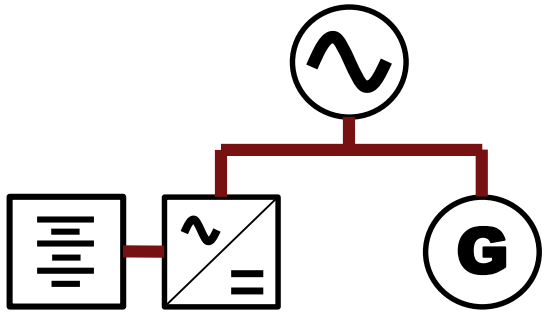
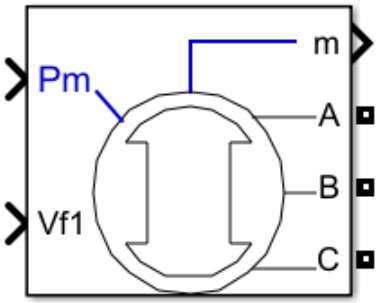
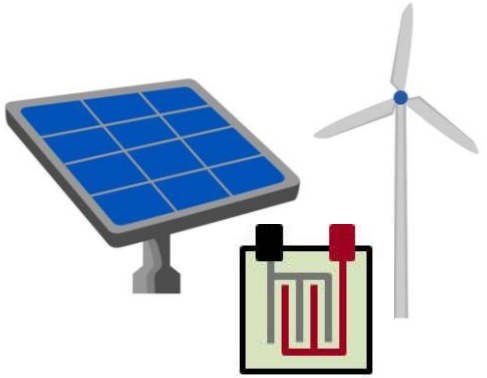
Modeling Distributed and Renewable Systems

Introduction to Simulation with Simscape Power Systems







Jonathan LeSage, PhD

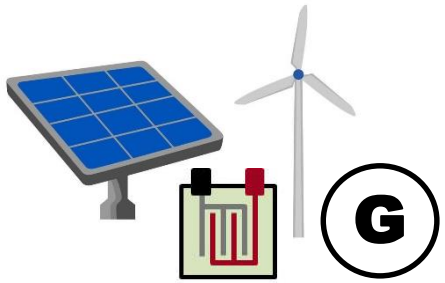
Senior Application Engineer - Energy and Automation

MathWorks, Inc.

Renewable/Microgrid Series Topics

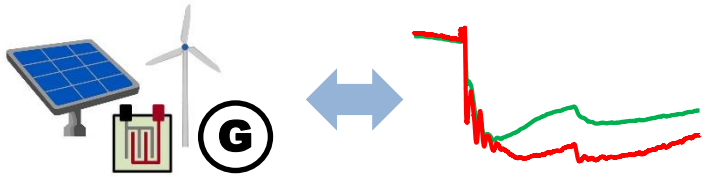
Distributed and Renewable Systems

Modeling and Simulation



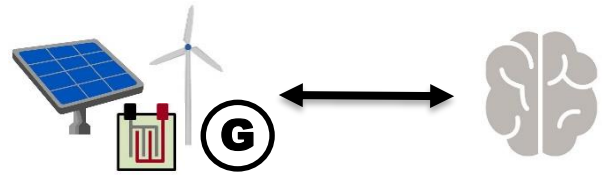
Addressing Validation Requirements

Integrated Workflows



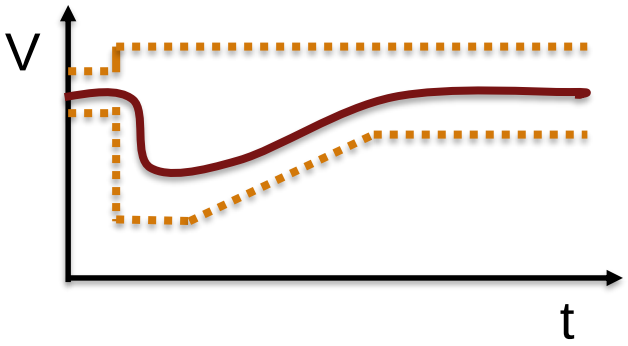
Energy Management Systems

Supervisory Control Design



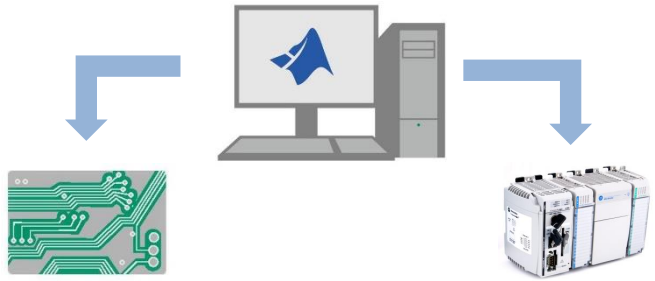
Testing Grid Codes and IEEE Standards

Validating Controls



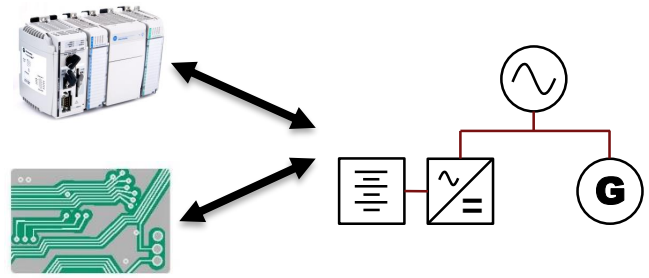
Deploy Vendor Agnostic Algorithms

C and PLC Code Generation

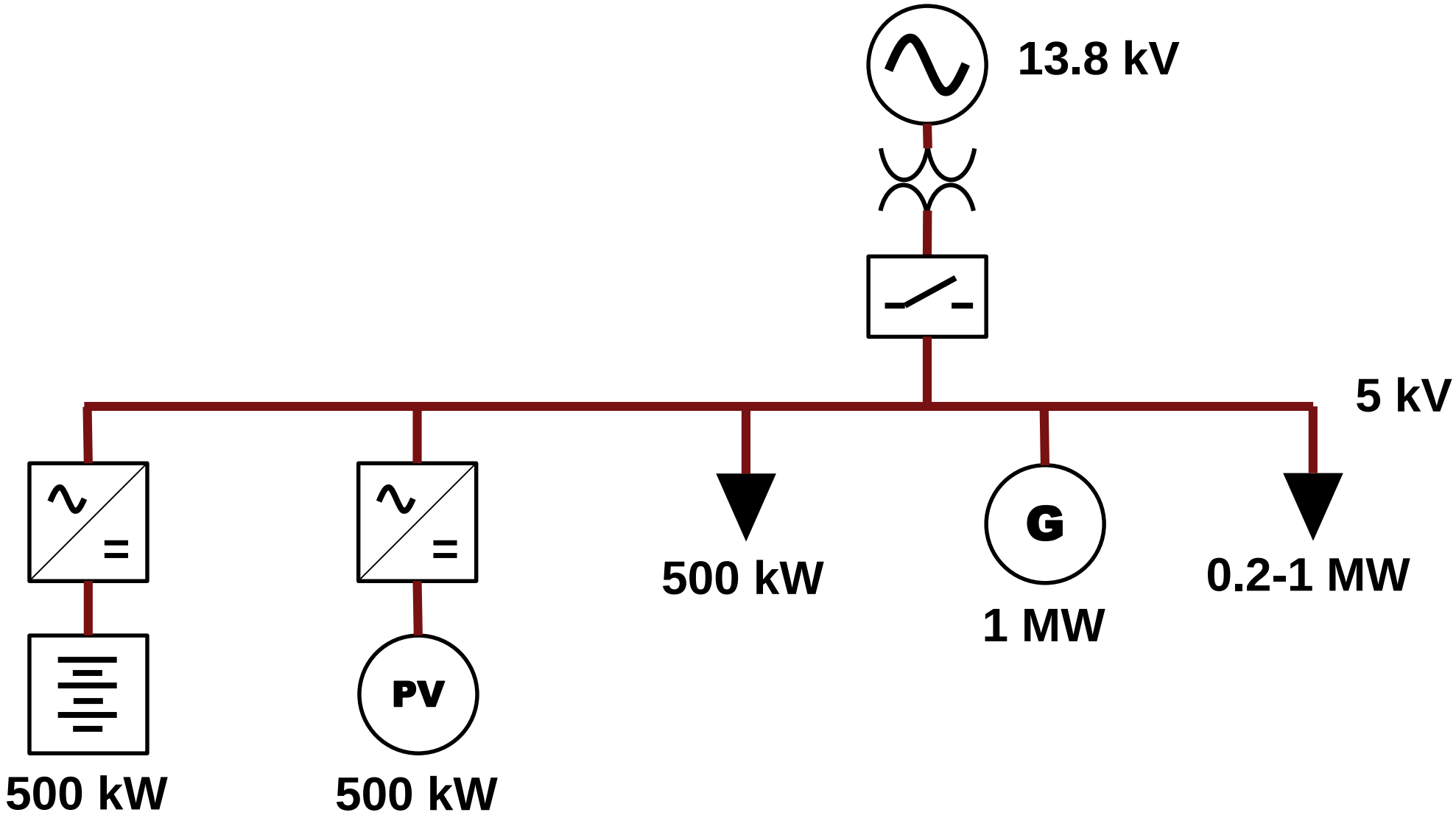


Grid Integration Studies

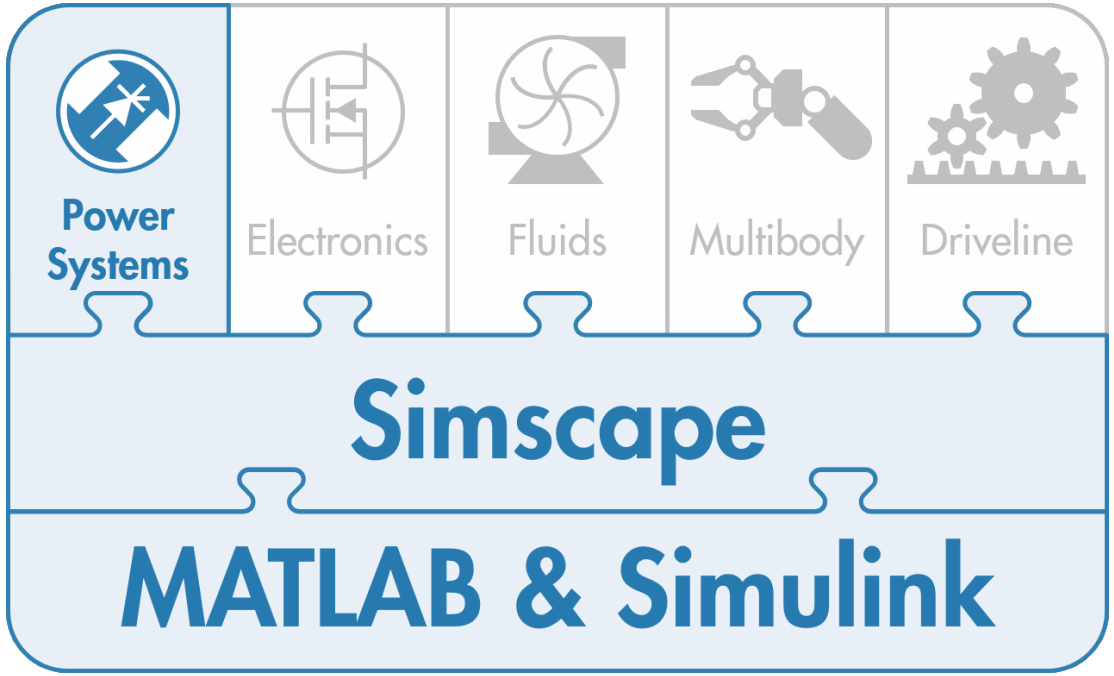
Real-Time Testing of Controllers

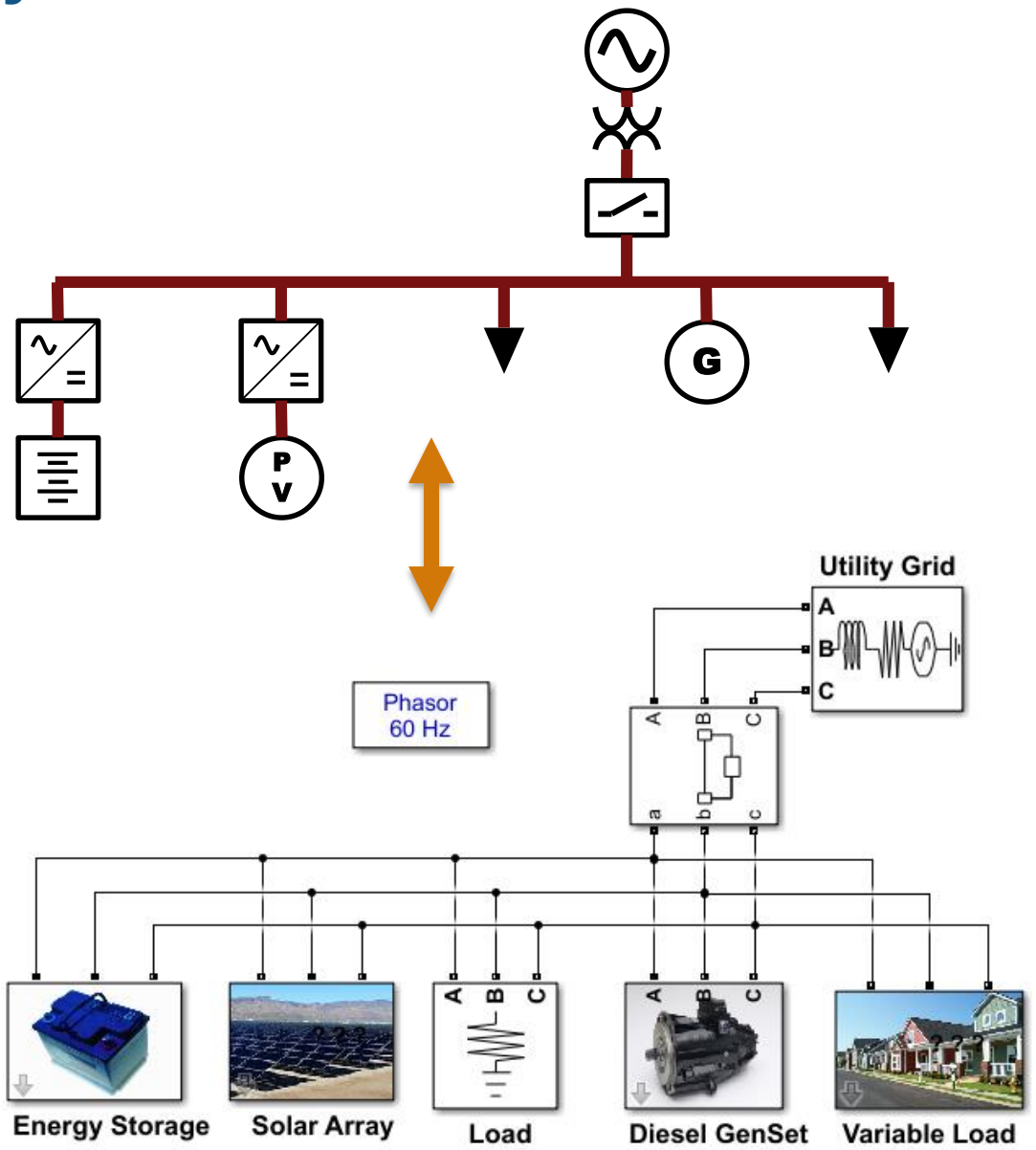


Example Microgrid One-Line Diagram



Introduction to Simscape Power Systems

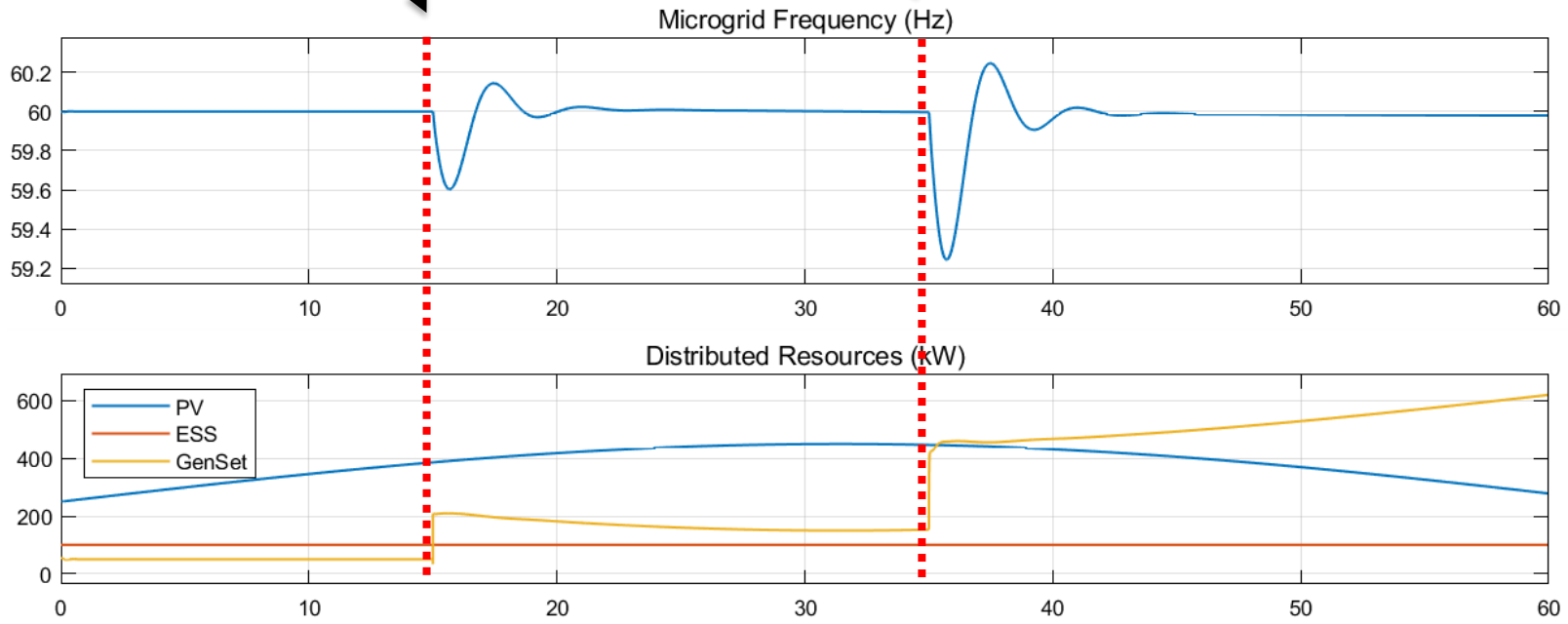


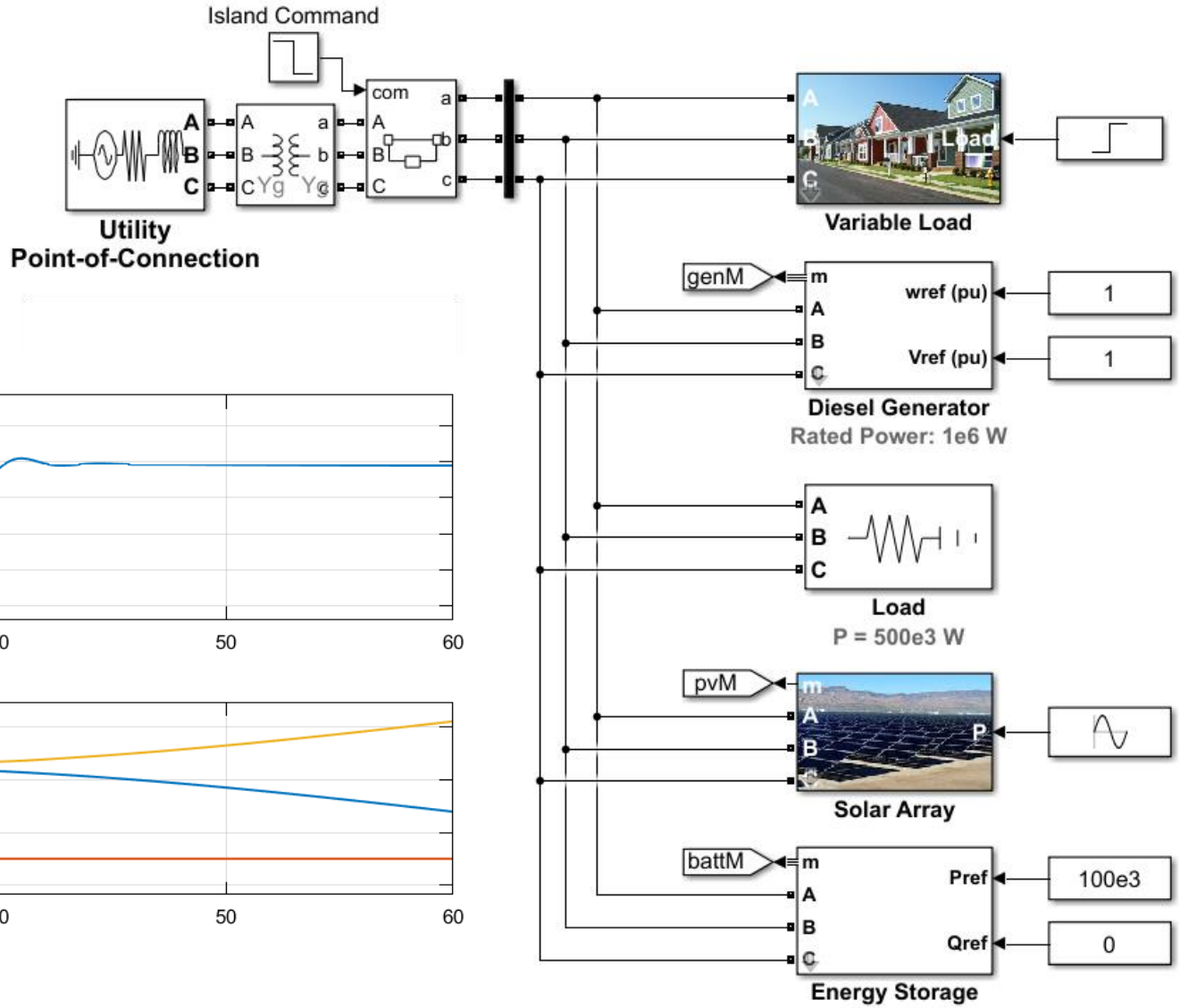


Implementing Microgrid One-Line Diagram in Simulink

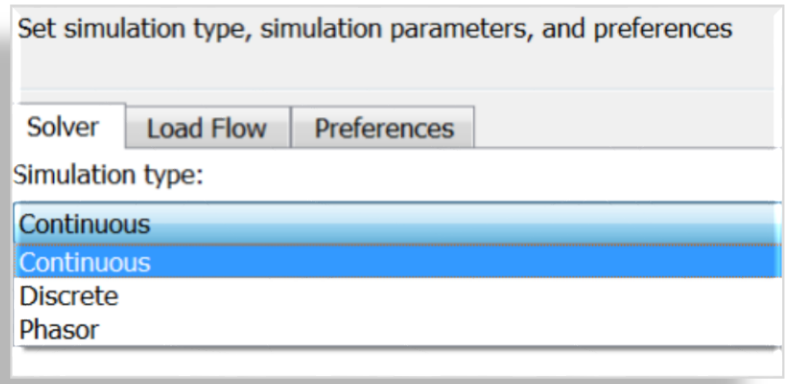
Island Microgrid at 15 seconds

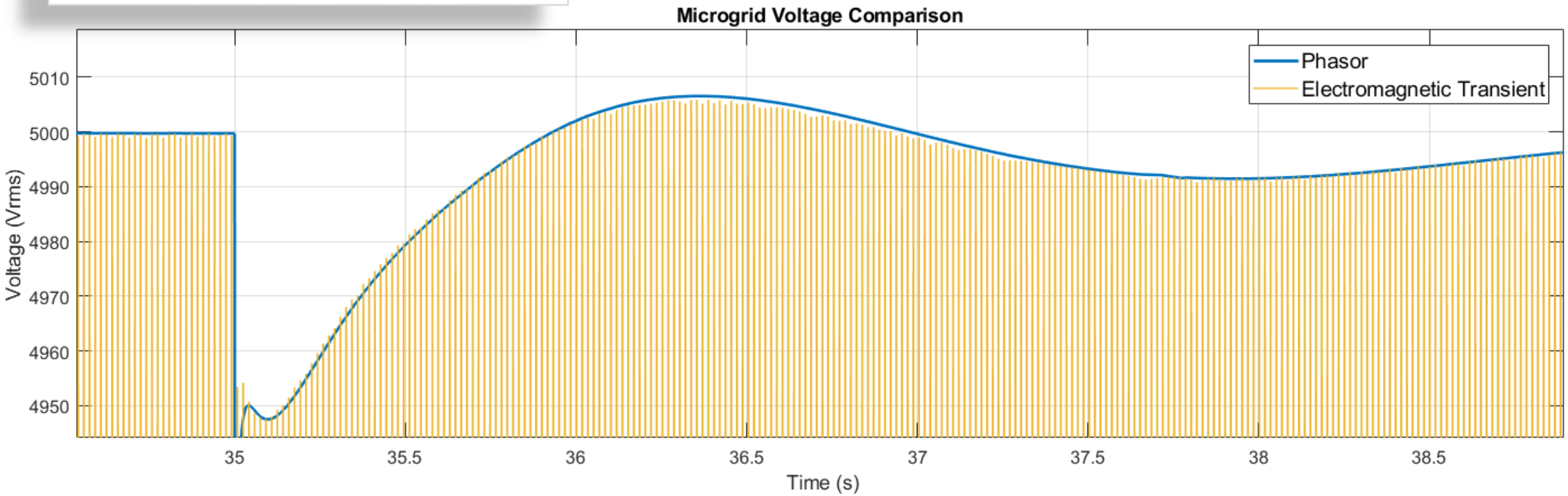
Add 300 kW Load at 35 seconds





Phasor and Electromagnetic Transient Comparison





Hybrid Phasor-EMT Simulation

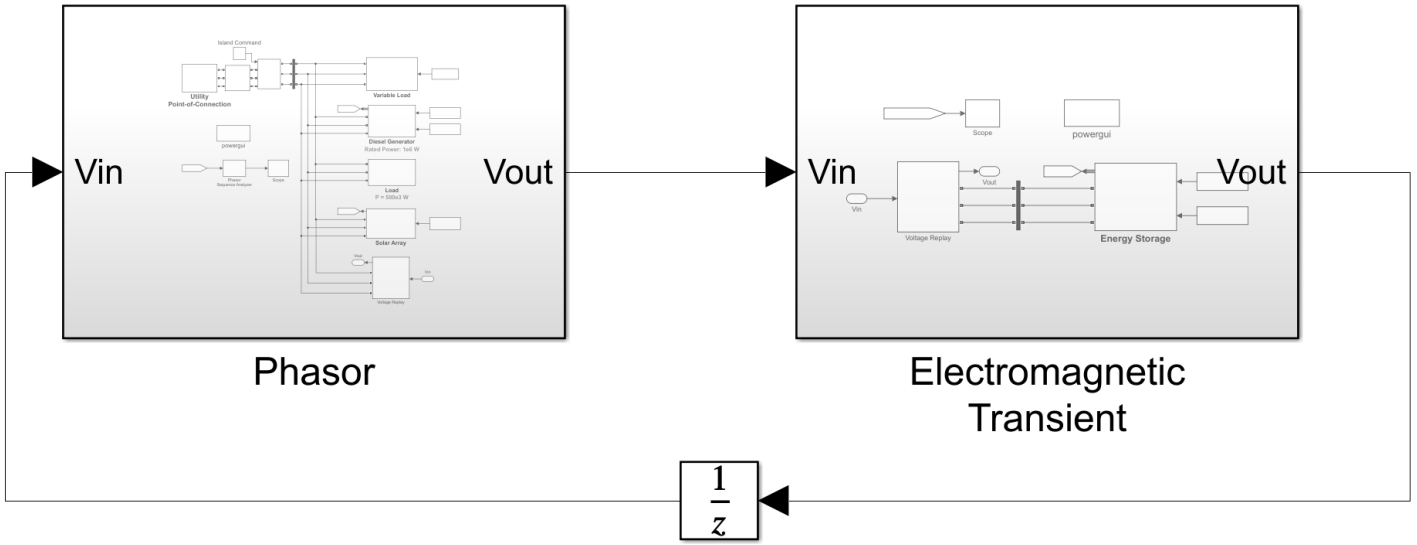
Phasor
60 Hz

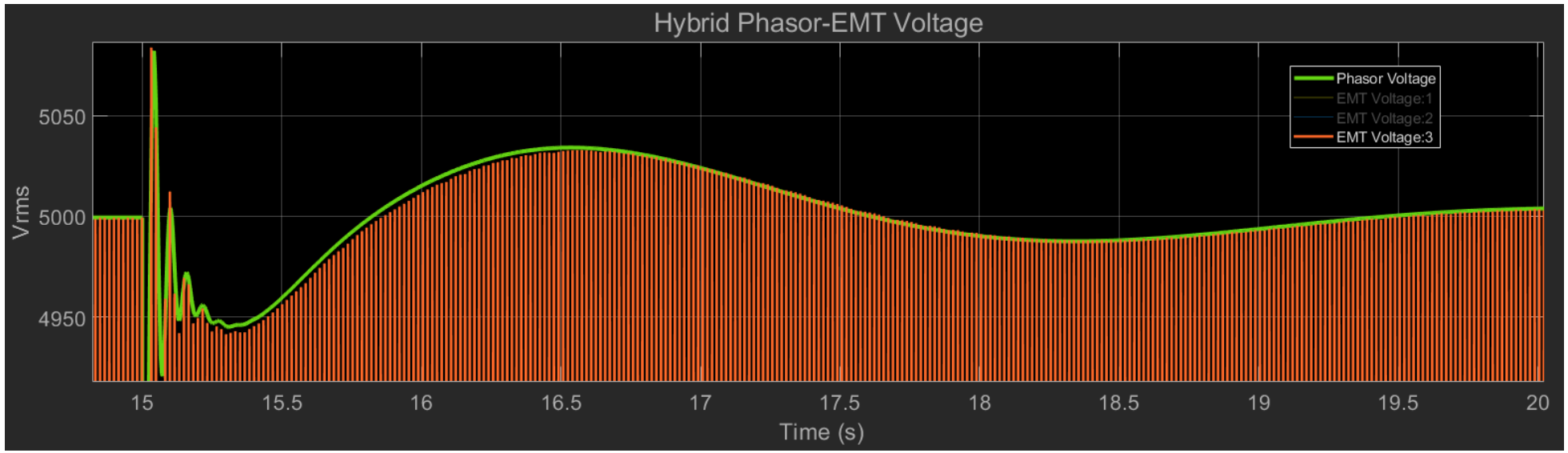
powergui

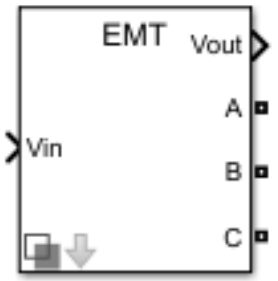
Discrete
0.0001 s.

powergui

Different "powergui" settings per subsystem



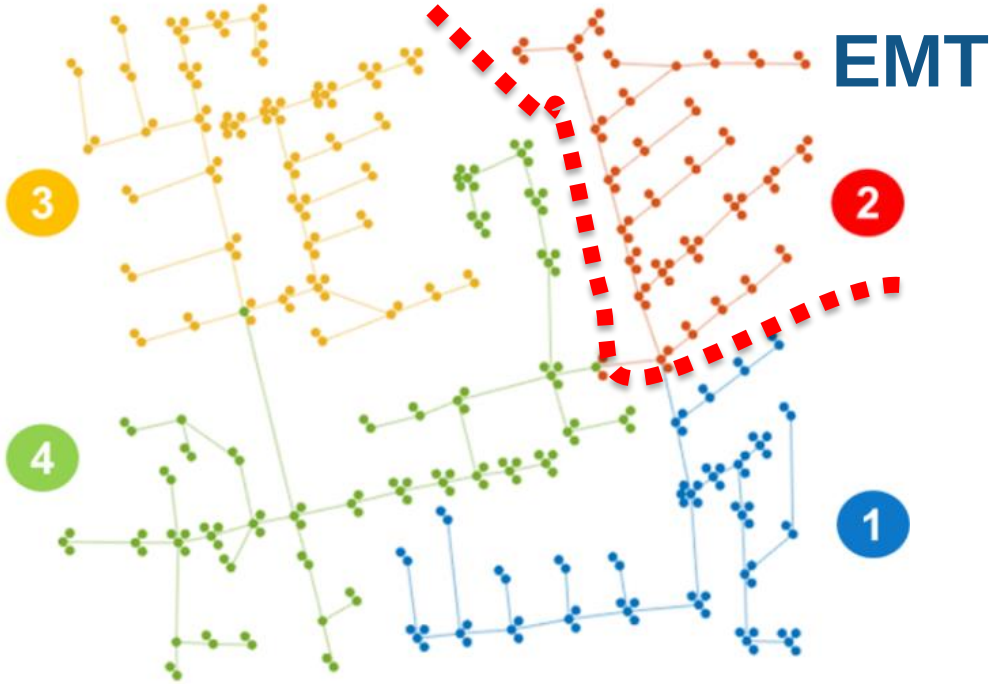


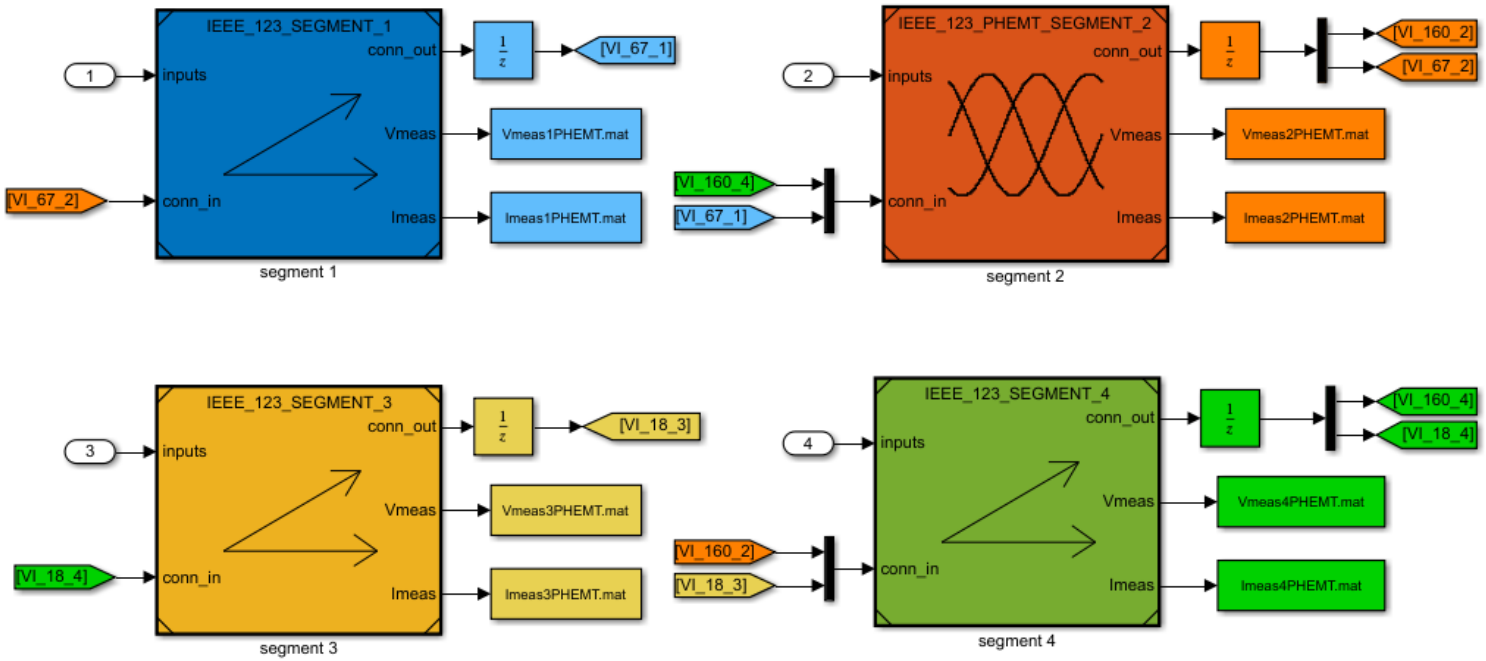


SPS-Simulink Interface

Hybrid Phasor-EMT Simulation

Scaling up simulation size – IEEE 123 Node Distribution Feeder with Hybrid Phasor-EMT





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Distributed and Renewable Systems
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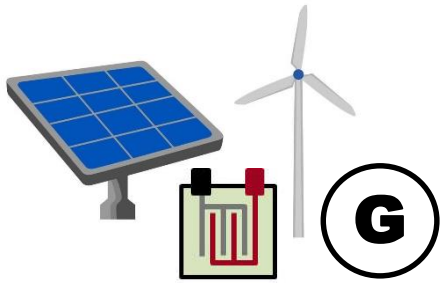

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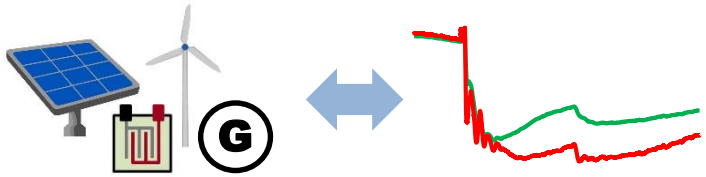

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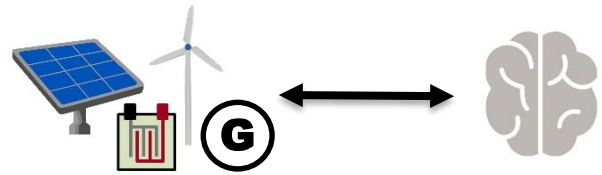

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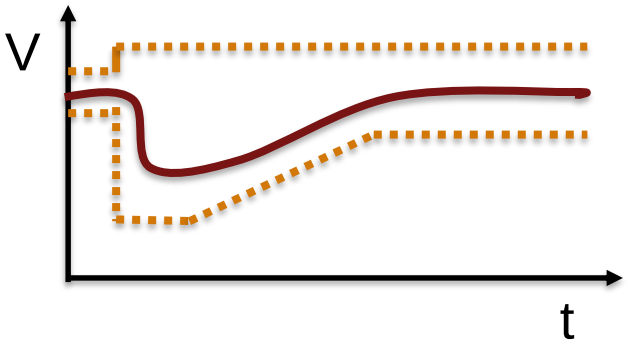

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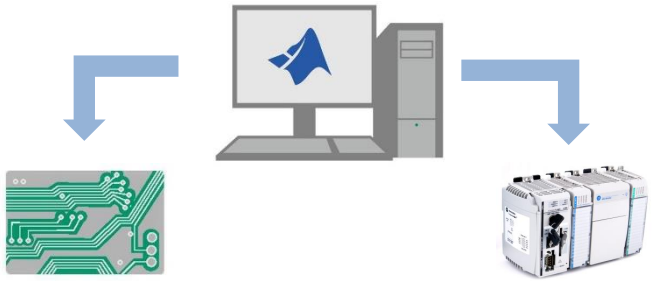

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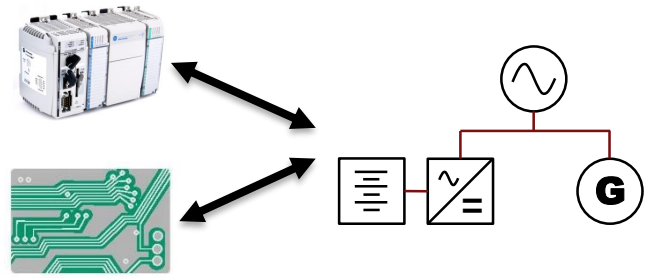

Deployment to Real-Time target

Configuration Parameters: simpleMicrogrid_RealTime/Configuration (Active)

Search

- Solver
- Data Import/Export
- Optimization
- Diagnostics
- Hardware Implementation
- Model Referencing

Simulation time

Start time: 0.0

Solver options

Type: Fixed-step

- Solver
- Data Import/Export
- Optimization
- Diagnostics
- Hardware Implementation
- Model Referencing
- Simulation Target
- Code Generation

Target selection

System target file: slrt.tlc

Language: C

Description: Simulink Real-Time

Build process

simpleMicrogrid_RealTime - Simulink

File Edit View Display Diagram Simulation Analysis Code Tools Help

simpleMicrogrid_RealTime

simpleMicrogrid_RealTime

Island Command

Utility Point-of-Connection

Variable Load