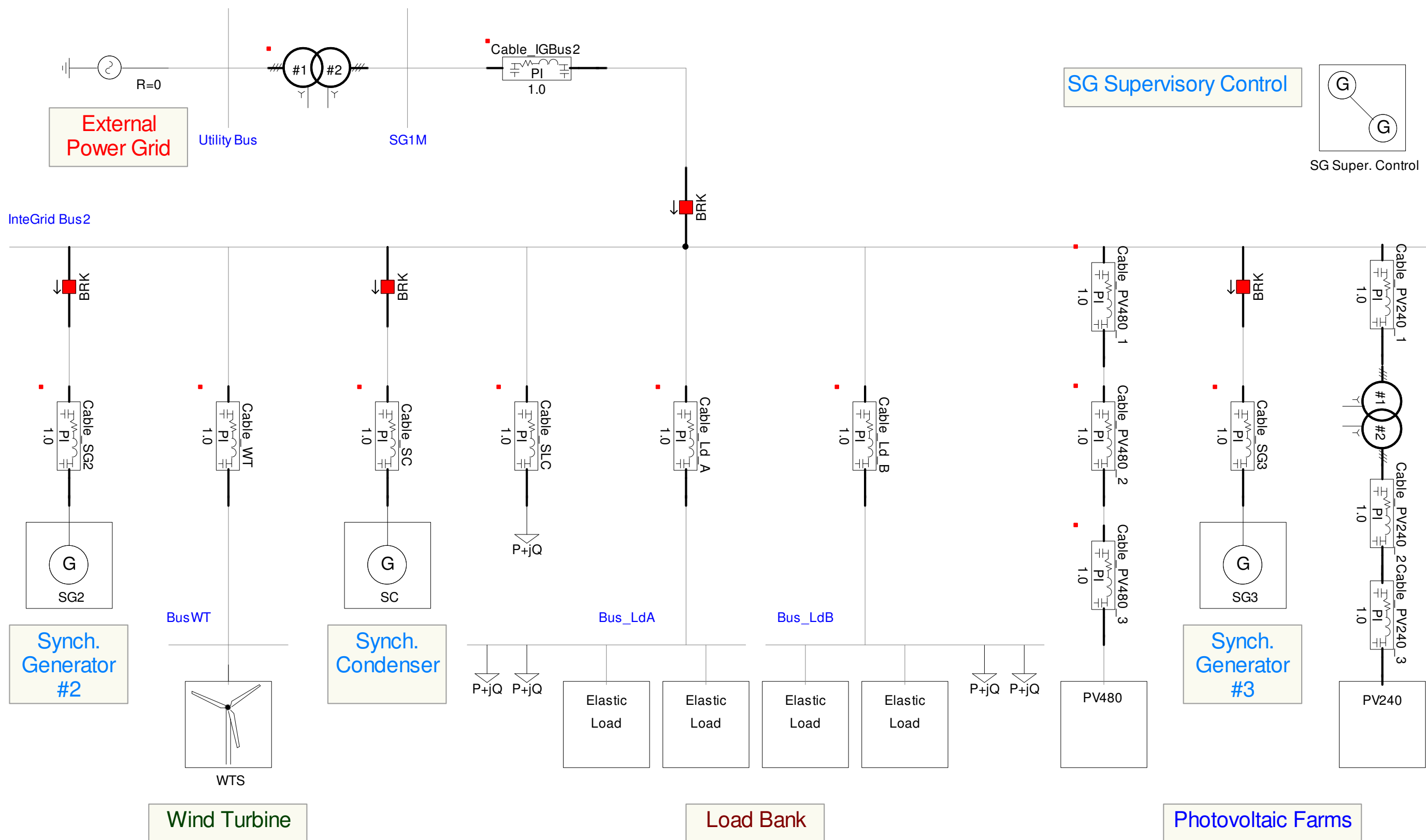# Modeling and Intelligent Control for an Electric Power Micro-Grid

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Introduction

- The micro-grid will be an important part of a future power system
- The micro-grid contains the typical elements in present and future power systems
- The micro-grid also contains some renewable energy sources, e.g., wind power, photovoltaic energy, and energy storage
- Power electronic devices/converters as interface between the renewable energy sources and the power grid
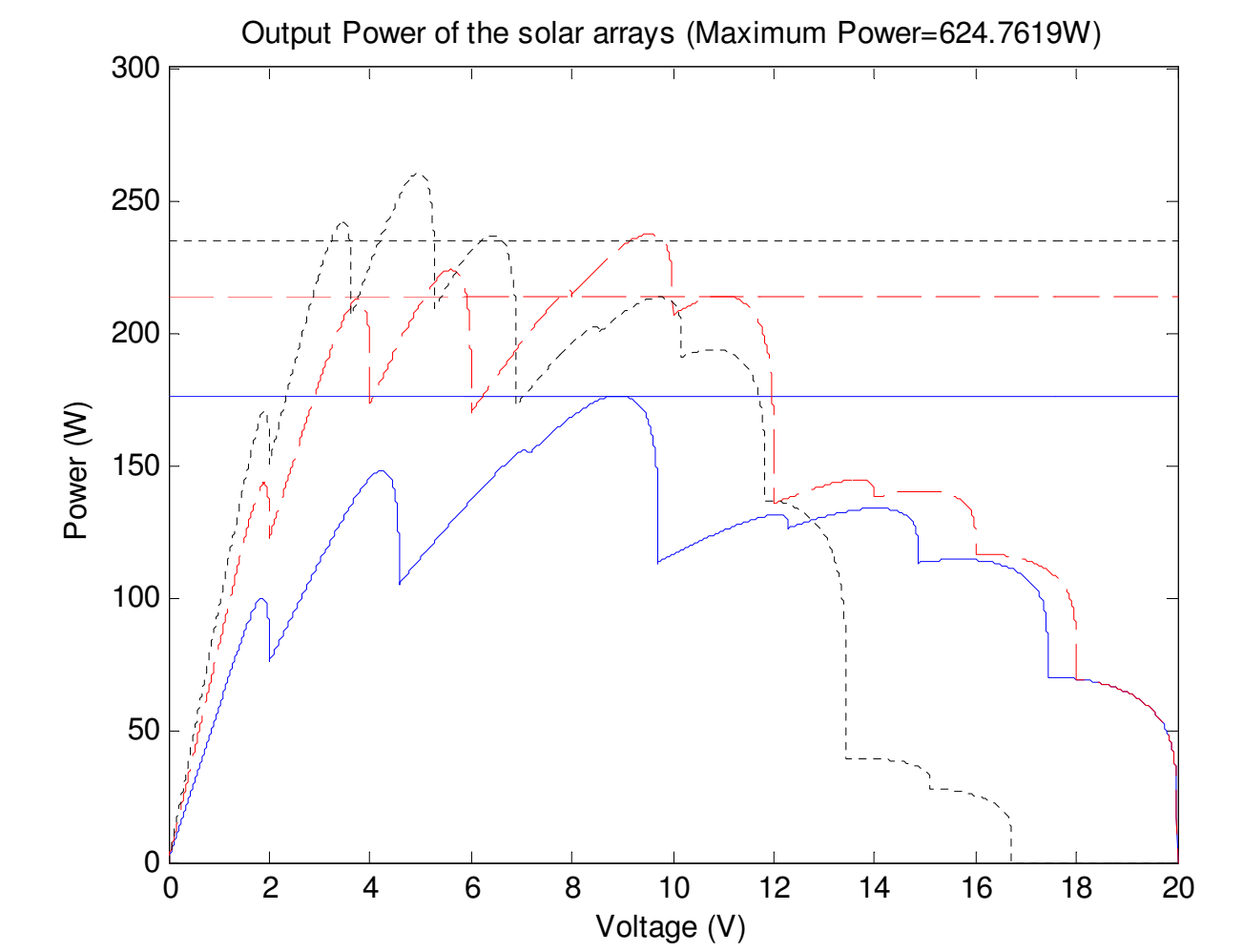- An intelligent controller will be designed to ensure the stability of the micro-grid

Modeling of the micro-grid

- Synchronous machines
  - ❑ Control two generators simultaneously
- Photovoltaic farm
  - ❑ Maximum power point tracking (MPPT)
- Wind turbine
  - ❑ Doubly-fed induction generator
  - ❑ Low-voltage ride through
- Elastic load
  - ❑ Battery management system

Basic structure of the micro-grid
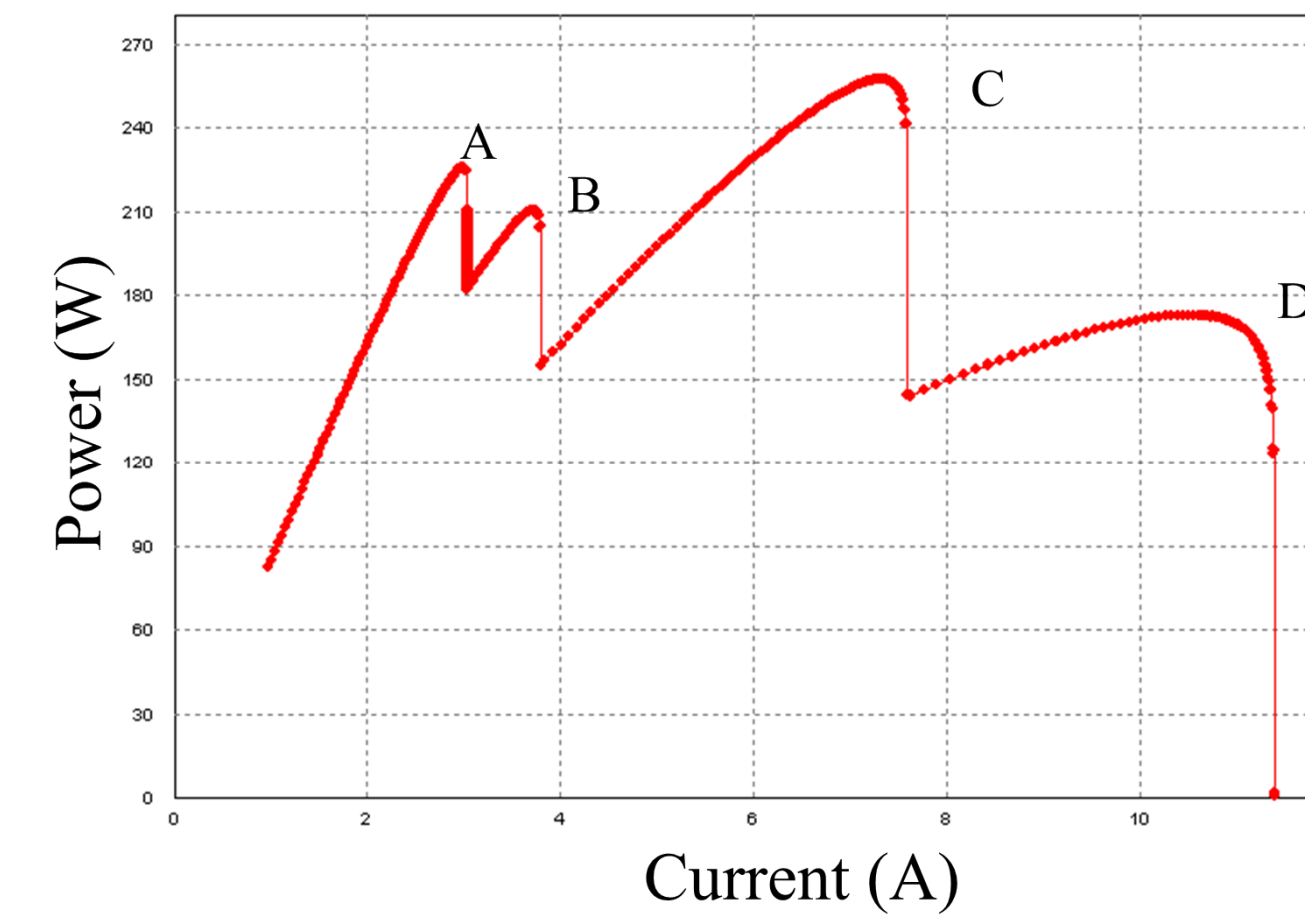
Output characteristics of a photovoltaic array

MPPT based on particle swarm optimization (PSO)

Future work

- Finish modeling the separate elements in PSCAD
- Test the stability of the micro-grid
- Design an intelligent controller to enhance the stability of the micro-grid
- Connect the micro-grid to the detailed external power grid and design the intelligent controller accordingly