A PATHWAY TO ENABLE SUSTAINABLE MODERN POWER SYSTEMS: OPTIMAL SYSTEM DISPATCH

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OUTLINE

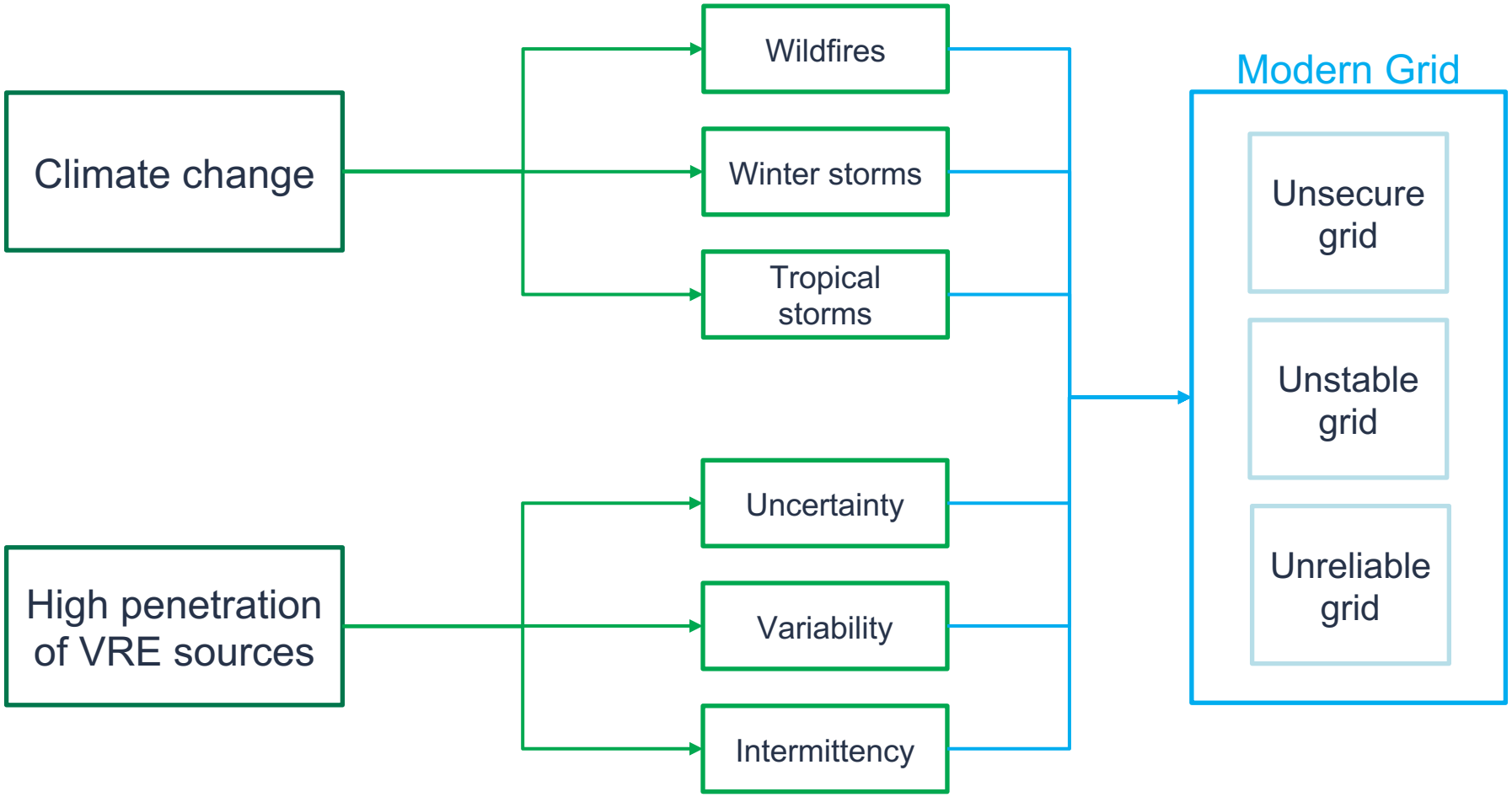
1 Project Objectives

2 Project Methodology

3 Future Work

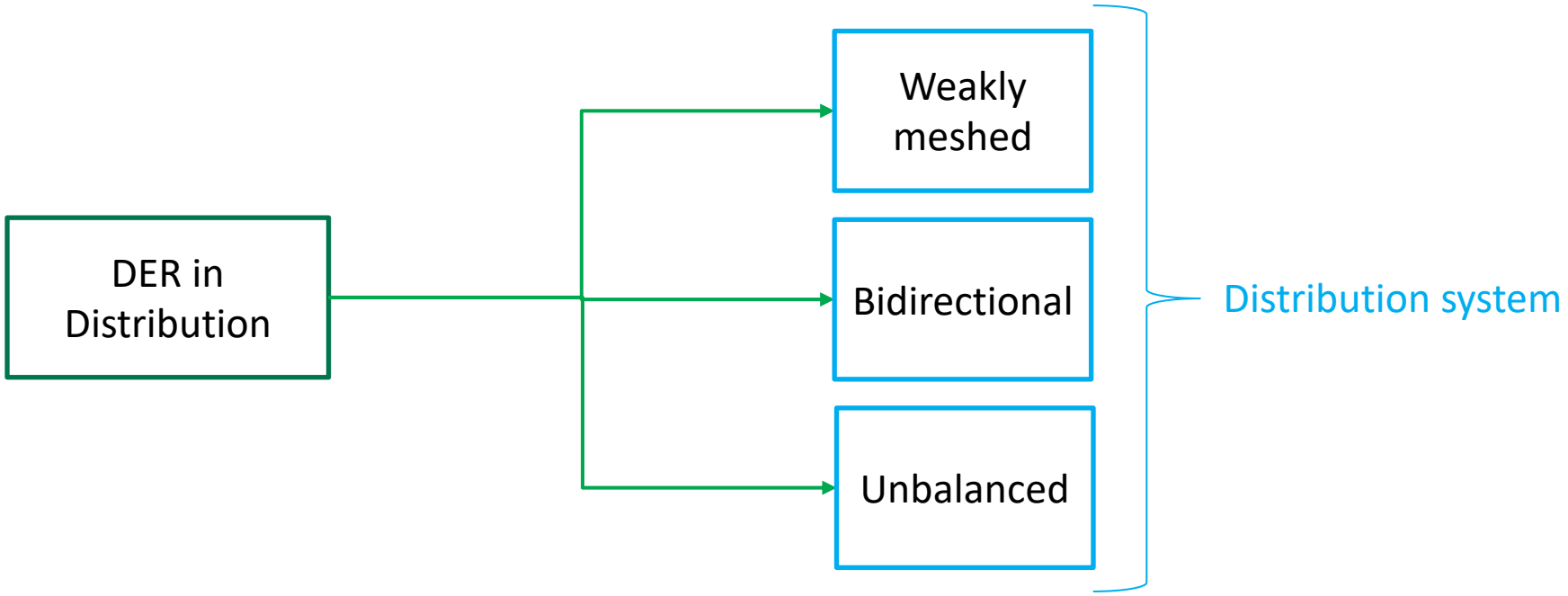
PROJECT OBJECTIVES

Background



PROJECT OBJECTIVES

Background



PROJECT OBJECTIVES

Goals

- Have a modern distribution power system that is more:
  - Reliable
  - Resilient
  - Sustainable
  - Secure
  - Stable

This require a shift in the grid planning and operations designs

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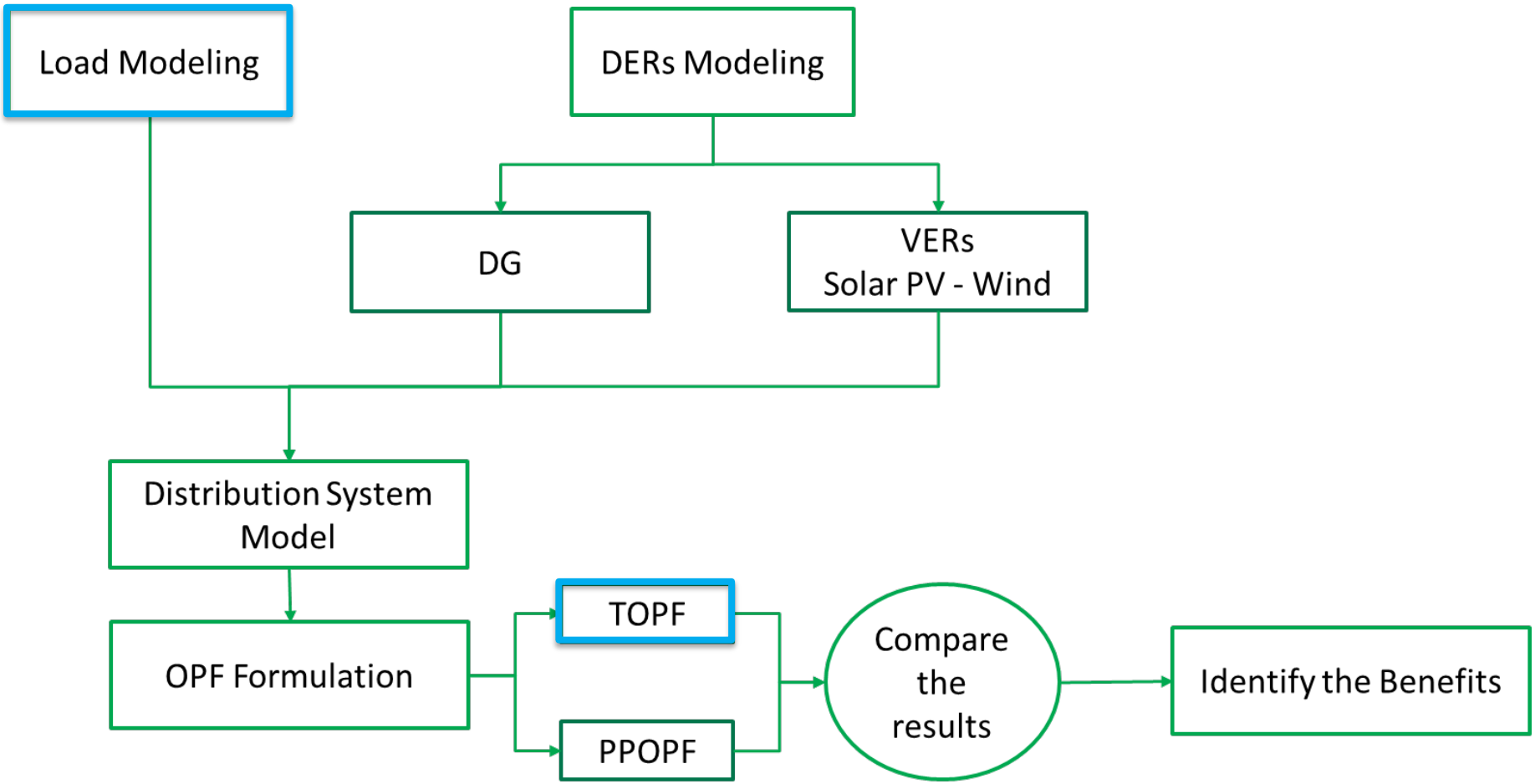
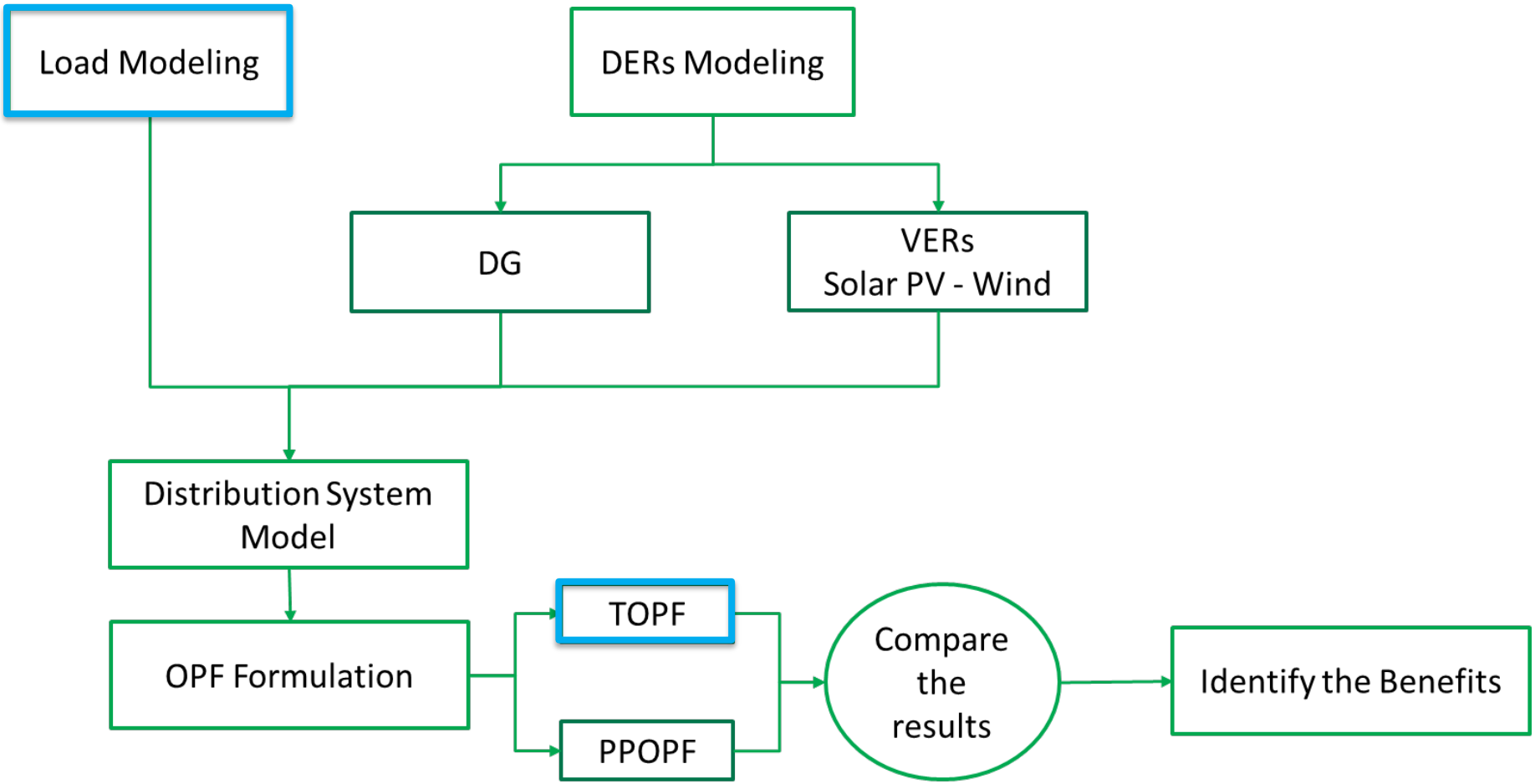
PROJECT METHODOLOGY

Workplan



PROJECT METHODOLOGY

Workplan



PROJECT METHODOLOGY

Load Modeling

- According to the U.S residential energy use data, the type of loads are:
  - Thermostatically controlled load (TCL)
  - Deferrable load (DL)
  - Elastic load (EL)
  - Inelastic load

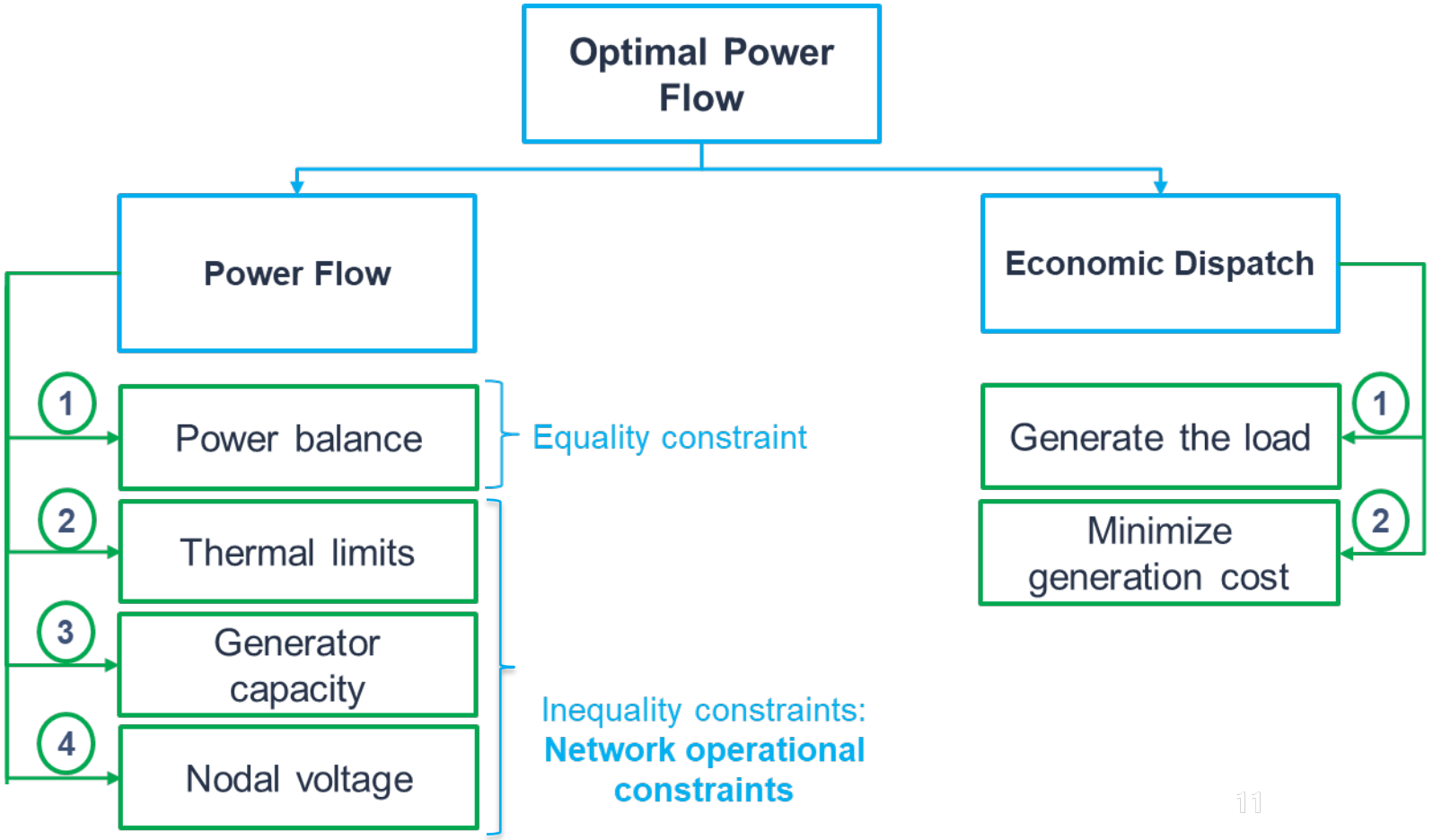
PROJECT METHODOLOGY

Load Modeling

Category	End Use
TCL	Space heating Space cooling
DL	Dishwashers Clothes dryers Clothes washer
EL	Lighting Television and related equipment

PROJECT METHODOLOGY

Load Modeling



PROJECT METHODOLOGY

Optimal Power Flow

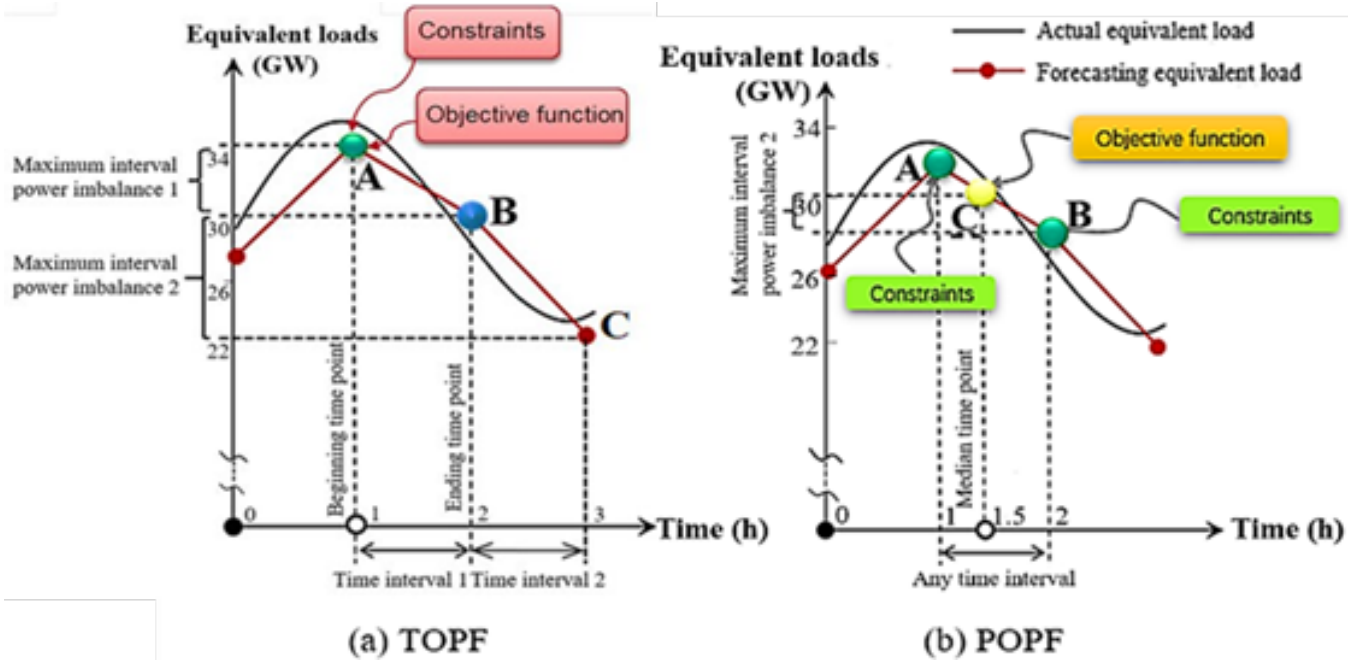
- OPF process is essential to all stages of the dispatch operational horizons

- Efficient OPF must be carefully integrated into the modern distribution system to:
  - Characterize the multi-dimensional uncertainties from VRE and DERs proliferation
  - Find a better trade-off between the computational efficiency and accuracy

PROJECT METHODOLOGY

Traditional OPF VS Progressive Period OPF

- PPOPF leverages median and endpoints on the forecasting interval to develop coherent coordination of OPFs between day-ahead and real-time.



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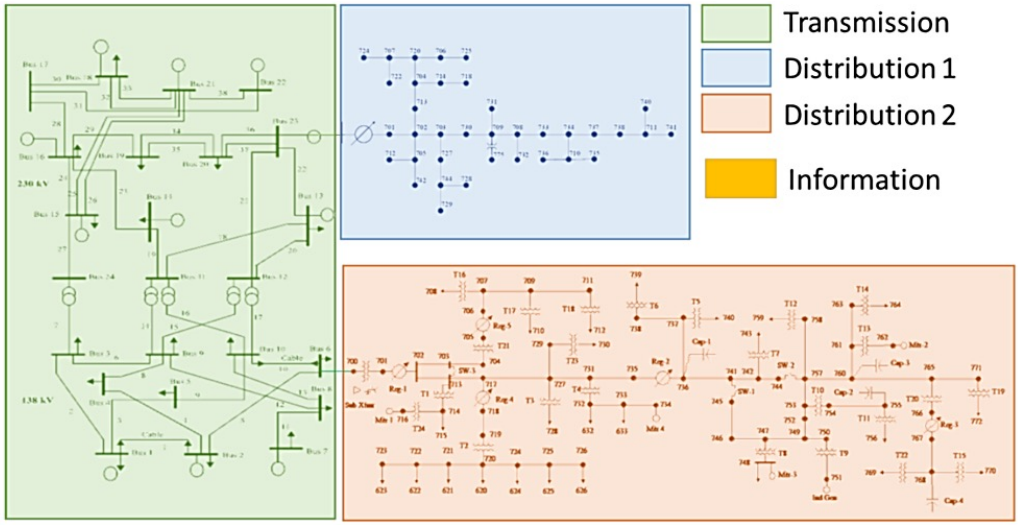
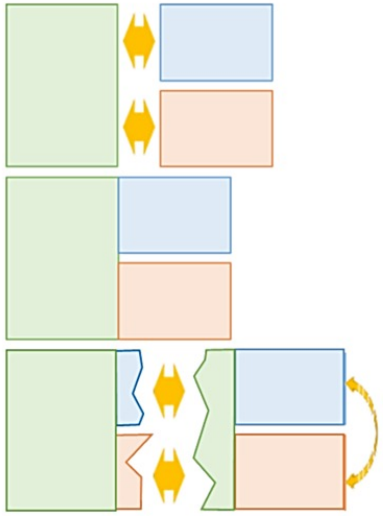
FUTURE WORK



(a) Network



(b) Model Structure

Traditional de-coupled system modeling

Fully-coupled system modeling

Partially-coupled bi-level framework modeling (proof-of-concept)

THANK YOU!