**Manual**

# **Credits**

These codes are developed by:

Zhiyuan Liu, University of Colorado, Boulder,

Xinyang Zhou, National Renewable Energy Laboratory,

Yi Guo, University of Texas, Dallas,

based on the algorithms developed in the following papers:

[1] X. Zhou, Z. Liu, C. Zhao, and L. Chen, “Accelerated Voltage Regulation in Multi-Phase Distribution Networks Based on Hierarchical Distributed Algorithm”, https://arxiv.org/abs/1903.00072, 2019.

[2] X. Zhou, Z. Liu, Y. Guo, C. Zhao, and L. Chen, "Gradient-Based Multi-Area Distribution System State Estimation," https://arxiv.org/abs/1909.11266, 2019

[3] X. Zhou, Z. Liu, W. Wang, C. Zhao, F. Ding, and L. Chen, “Hierarchical Distributed Voltage Regulation in Networked Autonomous Grids”, American Control Conference, https://arxiv.org/abs/1809.08624, 2019.

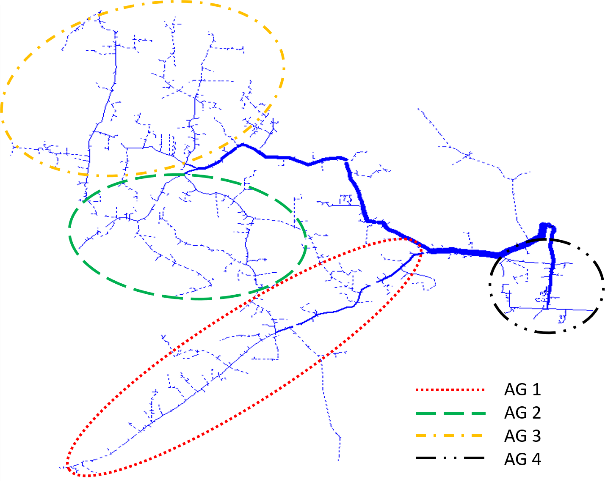
# **Basics**

1. The folder "11000\_node\_system" contains the 11,000-node test feeder settings for OpenDSS. Specifically,

* “MasterWang2.dss” is the main file that will be called from the OPF solver and the state estimation solver,
* “Lines.dss” is the modified line file,
* “TransformersWang.dss” sets regulators to 0 tap, and
* “Loadswenbo.dss” is the modified loads file.
* Default capacitor and regulator control can be disabled by “Set controlmode=Off”.

The folder "110000\_node\_system" contains the counterpart for 110,000-node test feeder settings for OpenDSS by connecting ten topologically identical 11,000-node systems at the substation. However, the set points are heterogeneous for the ten feeders.

2. The folder "python" contains linearization parameters and clustering settings based on the figure below, as well as the codes that generate these settings.



4. The folder "python" contains all the codes for the proposed controllers. All of the intermediate and final results are retained in this folder. Specifically, the following two files can be used to generate results directly:

* OPF\_hierarchical\_nestrov: This file implements the multiphase hierarchical OPF solver for 10k system.
* main\_SE\_multi: This file implements multi-area multiphase state estimation solvers for 10k system.

5. The folder "python\_110000" contains all the codes for the proposed controllers for 100k system. All of the intermediate and final results are retained in this folder. Specifically, the following two files can be used to generate results directly:

* OPF\_100k: This file implements the multiphase hierarchical OPF solver for 100k system.
* SE\_100k: This file implements the multiphase multi-area SE solver for 100k system.