Greedy-Search through Matlab-OpenDSS DLL Help Me

This document shall serve to explain the use and implementation of the greedy-search algorithm through the Matlab-OpenDSS DLL to locate and analyze worst-case impacts of high PV penetration within distribution circuits. Here, the IEEE 123 test case is considered.

Before attempting to run anything in Matlab, the OpenDSS software must be downloaded and installed. Make sure the "IEEE123Master" file, which is included within the OpenDSS package, is able to run and solve successfully. Code containing the greedy-search algorithm and circuit initializations is contained in the "GreedySearch.m" matlab file. The "Main.m" file runs the "GreedySearch" Matlab function. To run this code, please follow these steps:

1. In "Main.m", change the "OpenDSSFileName" variable to the respective file location of "IEEE123Master",
2. In "GreedySearch.m", initialize variables,
    a. Desired percent of over/under voltages
    b. PVScenario
        i. "Large" – PV to three-phase location
        ii. "Small" – PV to service transformer
    c. Load scenario (can be changed to desired levels)
        i. Minimum load – 0.24 pu
        ii. Midday minimum load – 0.51 pu
        iii. Midday maximum load – 0.79 pu
        iv. Maximum load – 1 pu
3. Run main script.

"GreedySearch.m" flows in the following way:

1. Over/under voltage percent, load scenario, and PV scenario are set
2. Regulation equipment (i.e. voltage regulators and switched capacitors) are locked to their natural settings during load scenario with no PV penetration
3. Establish PVs at base levels
4. Adjust alpha until desired over/under voltage percent is achieved
    a. Progression of over/under voltage percent will be displayed
5. Perform greedy-search algorithm
    a. Progression of algorithm will be displayed

Greedy-Search Results

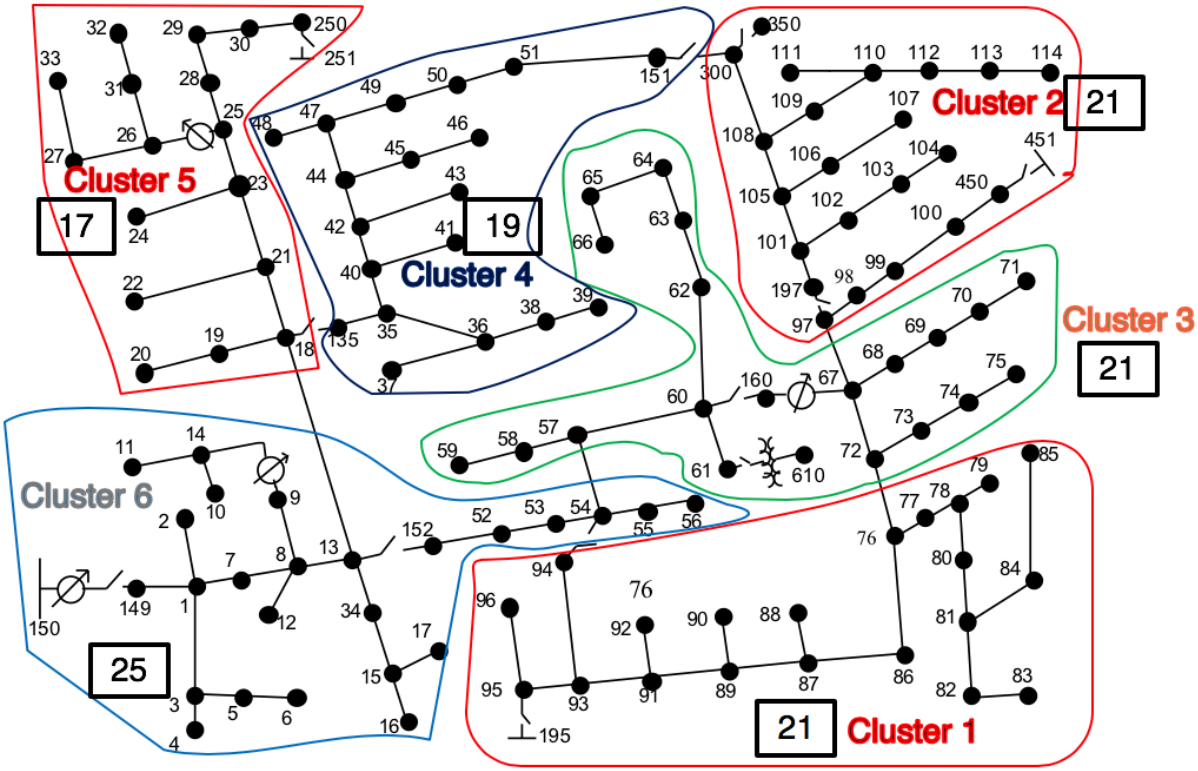

Figure 1 Defined clusters for IEEE-123 test feeder

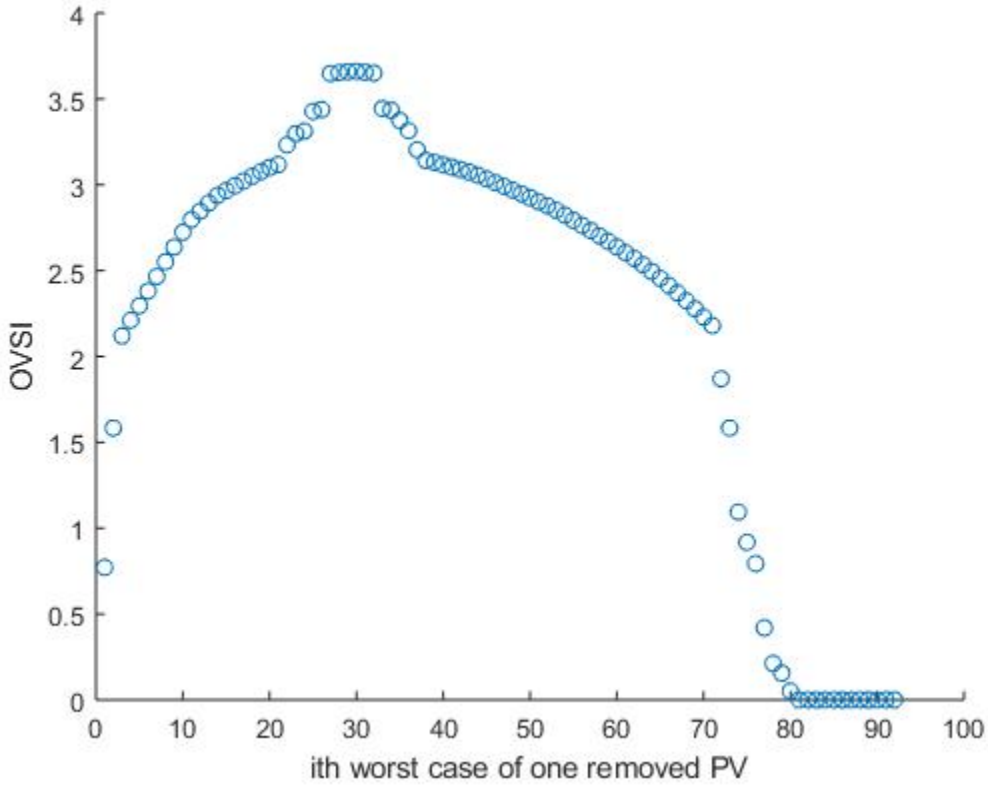

Figure 2 Greedy solution at each iteration for case of PV-to-service transformer

Table 1 First 30 solutions to greedy search algorithm during case of PVs to service transformer

Greedy Solution	OVSI	Greedy Solution	OVSI
No PVs removed	0.771	PVs34c	2.994
PVs66c	1.583	PVs24c	3.021
PVs92c	2.120	PVs30c	3.049
PVs85c	2.211	PVs50c	3.077
PVs100c	2.296	PVs49c	3.100
PVs104c	2.381	PVs76c	3.118
PVs103c	2.466	PVs17c	3.233
PVs73c	2.552	PVs31c	2.297
PVs74c	2.637	PVs32c	3.321
PVs75c	2.724	PVs41c	3.427
PVs62c	2.798	PVs4c	3.438
PVs83c	2.846	PVs6c	3.648
PVs84c	2.894	PVs5c	3.654
PVs102c	2.938	PVs65c	3.658
PVs16c	2.966	PVs35c	3.661

Table 2 Worst-case set of PVs determined by greedy search

Greedy Solution	OVSI
PV76	0
PV77	0
PV78	0
PV79	0
PV80	0
PV81	0
PV82	0
PV83	0
PV89	0
PV91	0
PV95	0

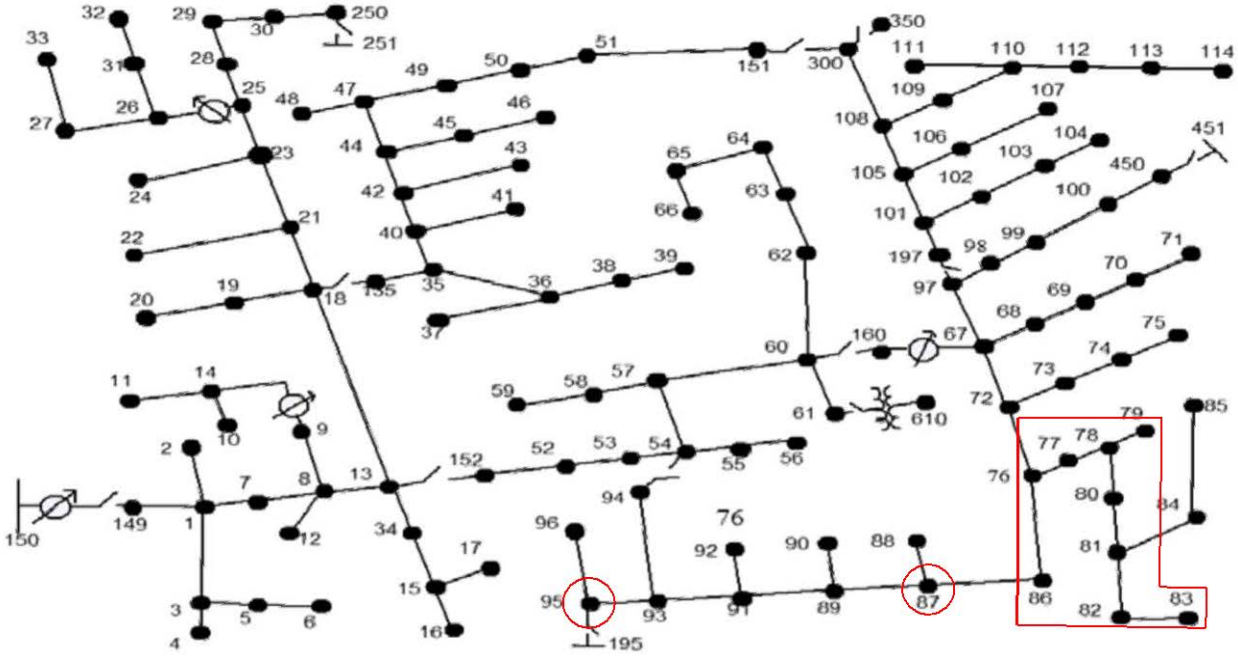

Figure 3 Locations of three-phase PVs left at end of greedy search