

Simulation Topology and Important Parameters

This document provides the topological diagram for the simulation of the bulk grid and the 82-node DER cluster, detailing DER capacity parameters, as well as system and control parameters.

The topological diagram for the bulk grid comprising 6 DER clusters is shown in Fig. 1:

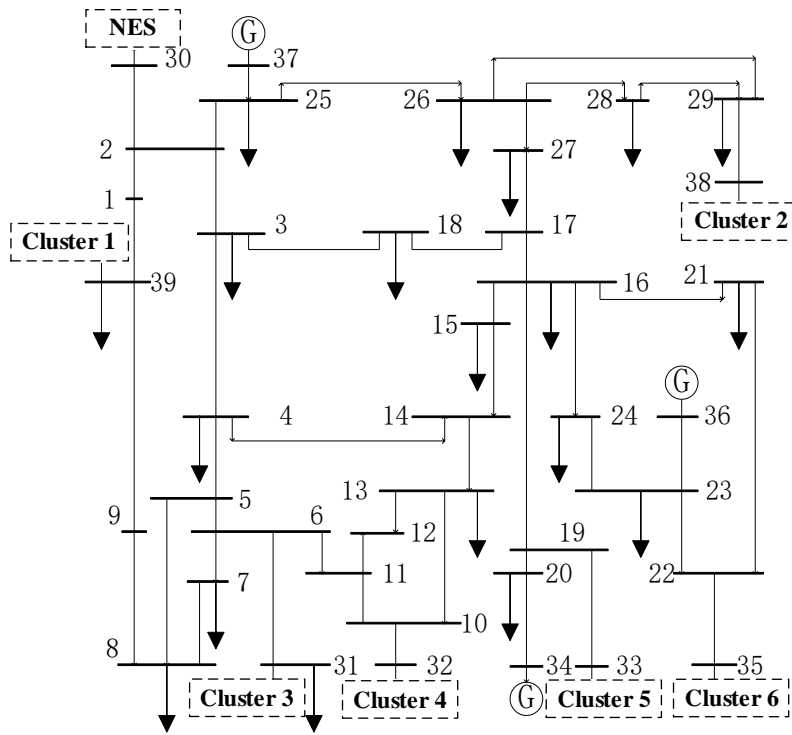


Fig. 1 Topology diagram of bulk grid

The cluster 6, an 82-node DER cluster, is selected as a representative for analysis, and its topological diagram is shown in Fig. 2:

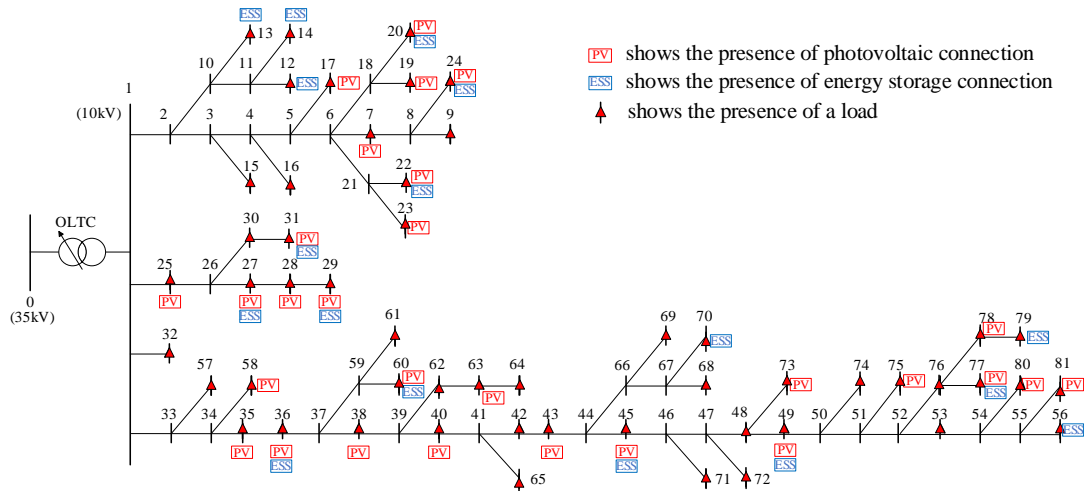


Fig. 2 Topology diagram of 10kV DER cluster

The capacity parameters of the controllable PV converters and ES converters are shown in Table I:

Controllable Resources	Nodes	Controllable Capacity/MVA
Energy Storage Converter	12、13、14、20、22、24、 27、29、31、36、45、49、 56、60、70、77、79	0.2
	22、25、27、36、38、58、 63、73、77、78	0.06
Photovoltaic Converter	23、24、31、43、60、75、81	0.12
	17、20、28、35、45、80	0.24
	7、19、29、40、49	0.36

The system and control parameters are shown in Table II:

Parameter Name	Value
Maximum unbalanced power	16400KW
System inertia	650 MW • s/Hz
Initial P/f droop coefficient for each DER cluster	6MW/Hz
Overall P/f droop coefficient for new energy station	10MW/Hz
Governor deviation coefficient for thermal power plant	3.333%
Turbine equivalent inertia time constant	6s
Turbine characteristic coefficient	0.0999
Optimization period	20s
Optimization time scale	0.5s
Frequency discrete time scale	1ms
P/f droop coefficient optimization granularity	20s
Q/V droop coefficient optimization granularity	20s
Iterative convergence criterion value	0.001MW/Hz
Upper/lower limits of the stored energy of ES	[0.05,0.95]
Charging/discharging efficiency of ES	95%
The number of partitions in the adaptive McCormick technique	3
The convergence criterion of the adaptive McCormick technique	0.0001
The initial contraction factor ε^1 of the adaptive McCormick technique	0.02
The contraction factor τ of the adaptive McCormick technique	0.01