Simulation Topology and Important Parameters

This document provides a topological diagram for the simulation of distribution networks, detailing DER capacity parameters, as well as system and control parameters.

The topological diagram for distribution network simulation is shown in Fig. 1:

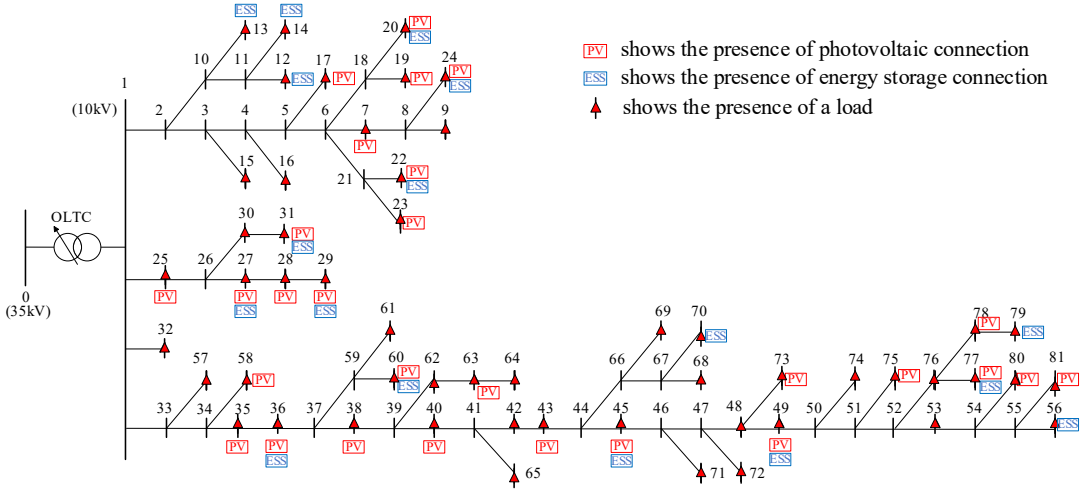

Fig. 1 Topology diagram of 10kV ADN

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

TABLE I

PARAMETERS OF CONTROLLABLE PV INVERTERS AND ESS INVERTERS

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
Photovoltaic Converter	22、25、27、36、38、58、63、73、77、78	0.06
	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 technical parameters of energy storage system are shown in Table II:

TABLE II

TECHNICAL PARAMETERS OF ENERGY STORAGE SYSTEM

Controllable Resources	Nodes	Controllable Capacity/MVA	Charge and discharge loss ratio	Maximum/Minimum state of charge	Maximum discharge/charging power/MW
Energy Storage	12、13、14、20、22、24、27、29、31、36、45、49、56、60、70、77、79	0.2	5%	0.95/0.05	0.15/0.15

The system and control parameters are shown in Table III:

TABLE III

SYSTEM AND CONTROL PARAMETERS

Parameter Name	Value
Maximum unbalanced power	8000KW
Initial droop coefficient for the ADN	5MW/Hz
Initial droop coefficient for new energy station	15 MW/Hz
Initial droop coefficient for thermal power plant	30 MW/Hz
Turbine equivalent inertia time constant	6s
Turbine characteristic coefficient	0.333
Optimization period	20s
Optimization time scale	1s
Frequency prediction time scale	0.01s
Droop coefficient optimization time interval	20 s
Reactive power optimization time interval	5 s
Iterative convergence criterion value	0.001 MW/Hz

The topological diagram for bulk grid is shown in Fig. 2:

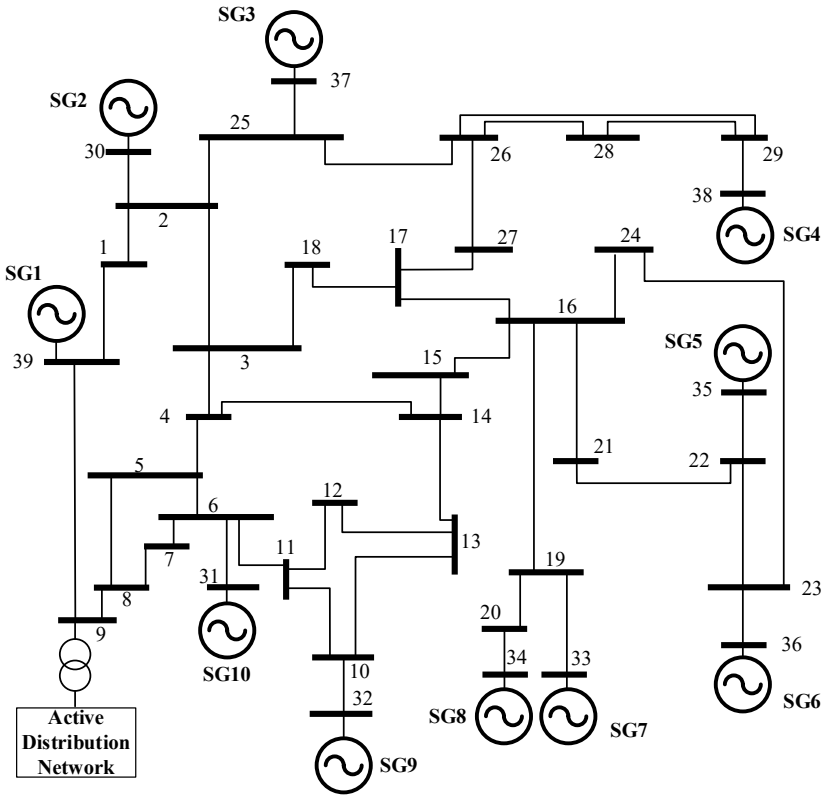

Fig. 2 Active distribution network integrated IEEE 39-bus test system.