Simulation Topology and Important Parameters

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

The topological diagram for DER cluster simulation is shown in Fig. 1:

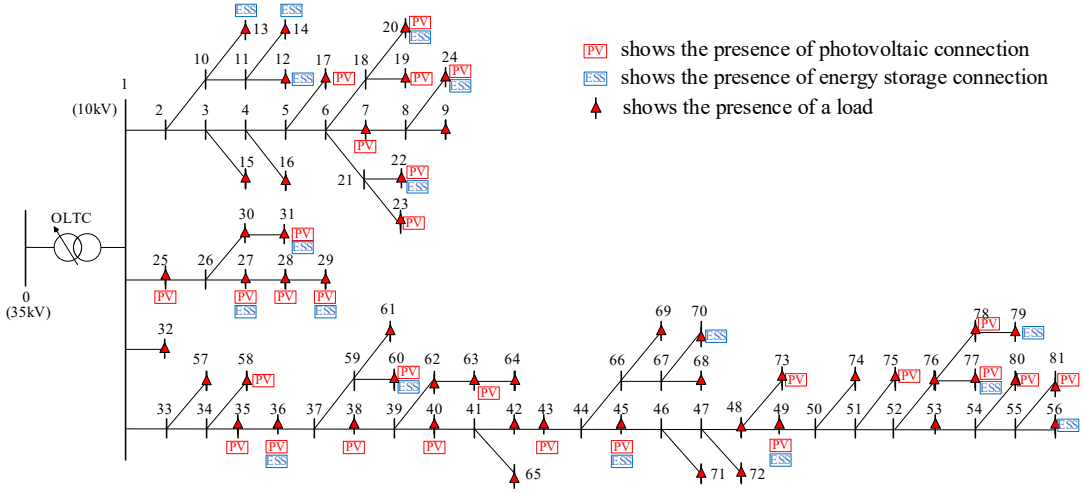

Fig. 1 Topology diagram of 10kV DER cluster

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 system and control parameters are shown in Table II:

TABLE II

SYSTEM AND CONTROL PARAMETERS

Parameter Name	Value
Maximum unbalanced power	8000KW
Initial active droop coefficient for the DER cluster	5MW/Hz
Initial active droop coefficient for new energy station	15MW/Hz
Governor deviation coefficient	3.333%
Turbine equivalent inertia time constant	6s
Turbine characteristic coefficient	0.333
Optimization period	20s
Optimization time scale	0.5s
Frequency prediction time scale	1ms
Active droop coefficient optimization granularity	20s
Reactive droop coefficient optimization granularity	20s
Iterative convergence criterion value	0.001MW/Hz

Description of the accelerated iterative method:

When the criterion (1) is unsatisfied, only the steps 5 and 9 in Table I (in paper) are executed to accelerate the calculation. When the criterion (1) is satisfied, the complete adaptive McCormick method is adopted to ensure the assessment effect.

$$K_f^{total}(t+1) - K_f^{total}(t) \le 1\text{MW/Hz} \tag{1}$$