

Simulation Topology and Important Parameters

This document provides a topological diagram for the simulation of the 82-node 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:

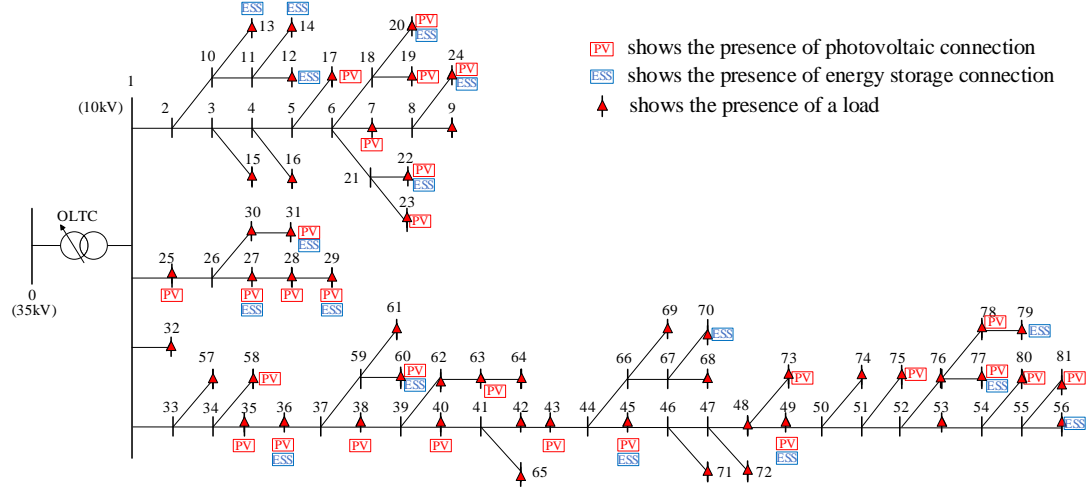


Fig. 1 Topology diagram of 10kV DER cluster

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

| Controllable Resources | Nodes | Controllable Capacity/MVA |
|--------------------------|----------------------|---------------------------|
| Energy Storage Converter | 12、13、14、20、22、24、 | 0.2 |
| | 27、29、31、36、45、49、 | |
| | 56、60、70、77、79 | |
| Photovoltaic Converter | 22、25、27、36、38、58、 | 0.06 |
| | 63、73、77、78 | |
| | 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 | 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 |