170_Research on bi-level optimization model considering the flexibility of active distribution network

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Introduction of your work

The flexibility and flexible resources of ADN are classified into node and network type;
A two-layer model optimization method is proposed to construct node type flexibility and network type flexibility respectively, which is divided into two independent steps to realize the flexibility optimization of ADN;
The effectiveness of the optimization method is verified by an example.

Methods of your work

1.Two evaluation indexes net load fluctuation rate and line capacity margin, which can characterize the node type andnetwork type flexibility indexes of ADN , are proposed.
2. Based on the basic optimal power flow model of ADN with second-order cone relaxation, the typical power electronic devices in distribution network are linearized.

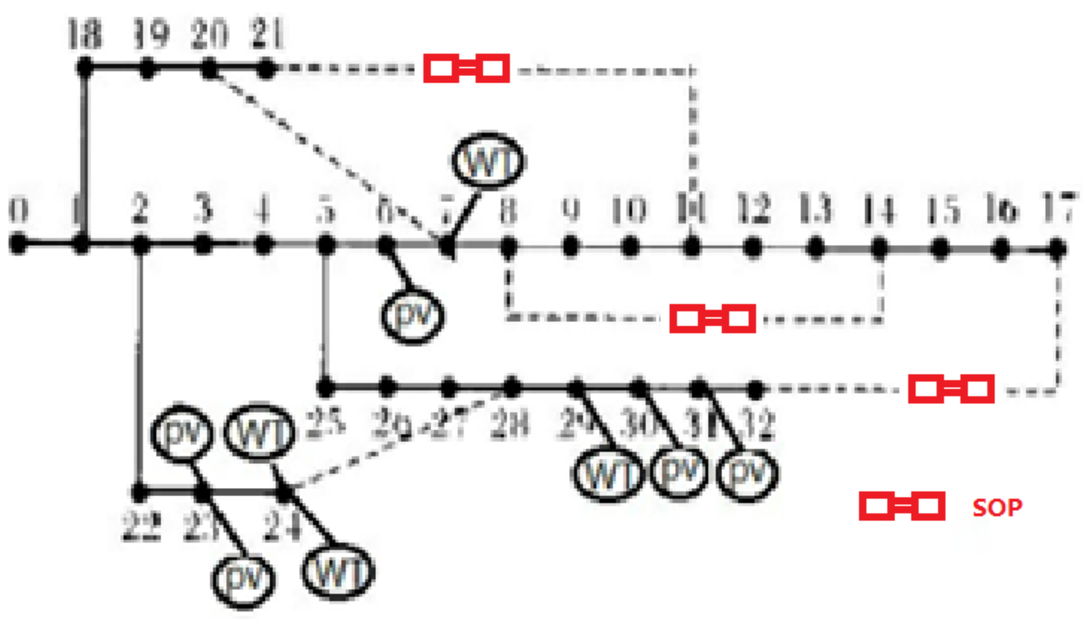

Fig.1 IEEE 33-bus distribution system

3. The two-level optimization model of ADN flexibility is established; The upper model aims at the node type flexibility of ADN, and the lower model aims at the network type flexibility of ADN , so as to realize the optimal solution of distribution network node type and network type flexibility by layers.

Results of your work

The upper model takes the load fluctuation rate as the typical node type flexibility optimization objective, and the results are as follows:

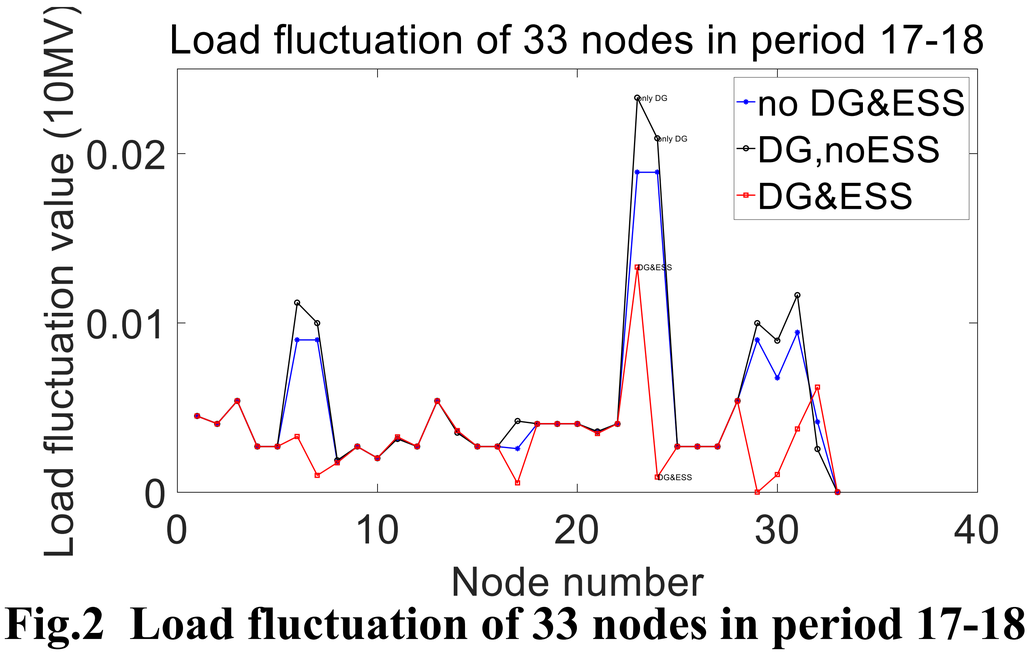

Fig.2 Load fluctuation of 33 nodes in period 17-18

The calculation results of index are as follows:

Table 1. Optimization results of upper layer model

scenario	load fluctuationvalue	purchase cost
No DG&ESS	12.2595	9.7244
DG&no ESS	14.3195	9.2207
With DG&ESS	7.7855	9.0822

The lower model takes the line capacity margin as the typical network type flexibility optimization objective, the results are as follows:

Table 2. Optimization results of upper and lower model

	line capacity margin	Net loss
Upper model	0.6420	0.3483
Lower model	0.6831	0.3440

Conclusions of your work

By dividing the flexibility resources of ADN intonode type and network type resources, a two-level model of ADN flexibility is constructed, which can improve the node type and netwok type flexibility of ADN in sequence and reduce the difficulty of modeling and solving.

Future perspective：

The study on the improvement of the flexibility of the ADN can be carried out by the optimal configuration of different power electronic evices