176 Research on locating and sizing method of unified power flow controller (UPFC)

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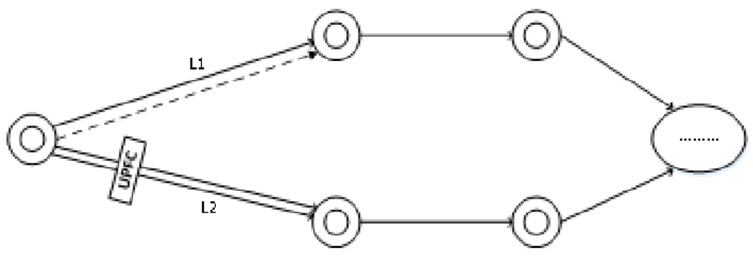
Introduction



UPFC can constrain the distribution of power flow within a large range, and can control the flow of power flow in the direction we expect.

Procedures of UPFC Locating and Sizing

(1) Analyze the current power flow of the power grid when UPFC is not installed, and determine the power flow section that needs to be paid attention to;

(2) Preliminarily select UPFC installation location;

(3) Calculate the capacity of the UPFC to be configured in different locations.

(4) Calculate the corresponding indicators according to the UPFC site selection and capacity index system;

(5) Calculate the scores of different schemes and choose the best scheme.

Index System of UPFC Locating and Sizing

(1)Section Transmission Capacity Improvement Index

Section power flow after UPFC installation /manximum power of the section $\frac{S_{UPFC}}{P_{\max}}$

(2)Line Power Flow Diversion Sensitivity Index

rate of load change in adjacent lines:

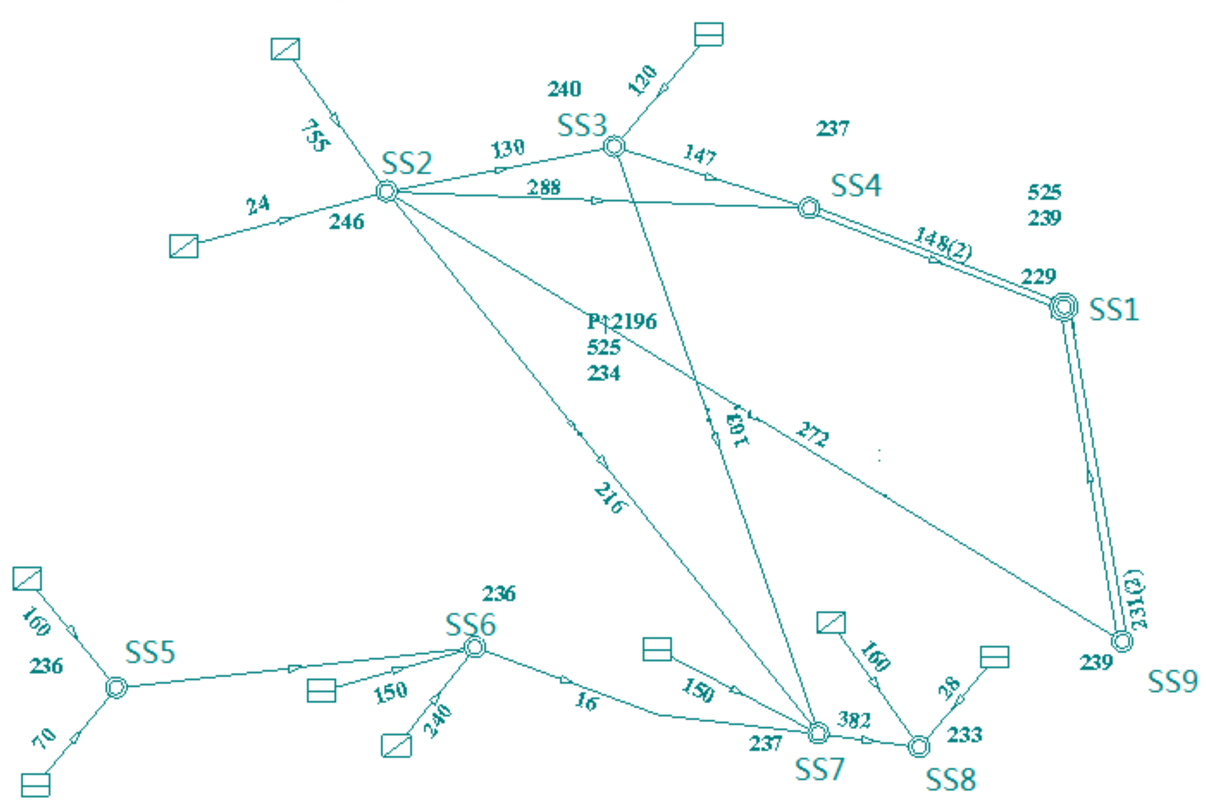
$$\gamma_i = \sqrt[n]{\left|\frac{\beta_1}{\beta_i}\cdot\frac{\beta_2}{\beta_i}\cdots\frac{\beta_{i-1}}{\beta_1}\cdot\frac{\beta_{i+1}}{\beta_i}\cdots\frac{\beta_n}{\beta_i}\right|}$$

(3)UPFC Installation Capacity Index

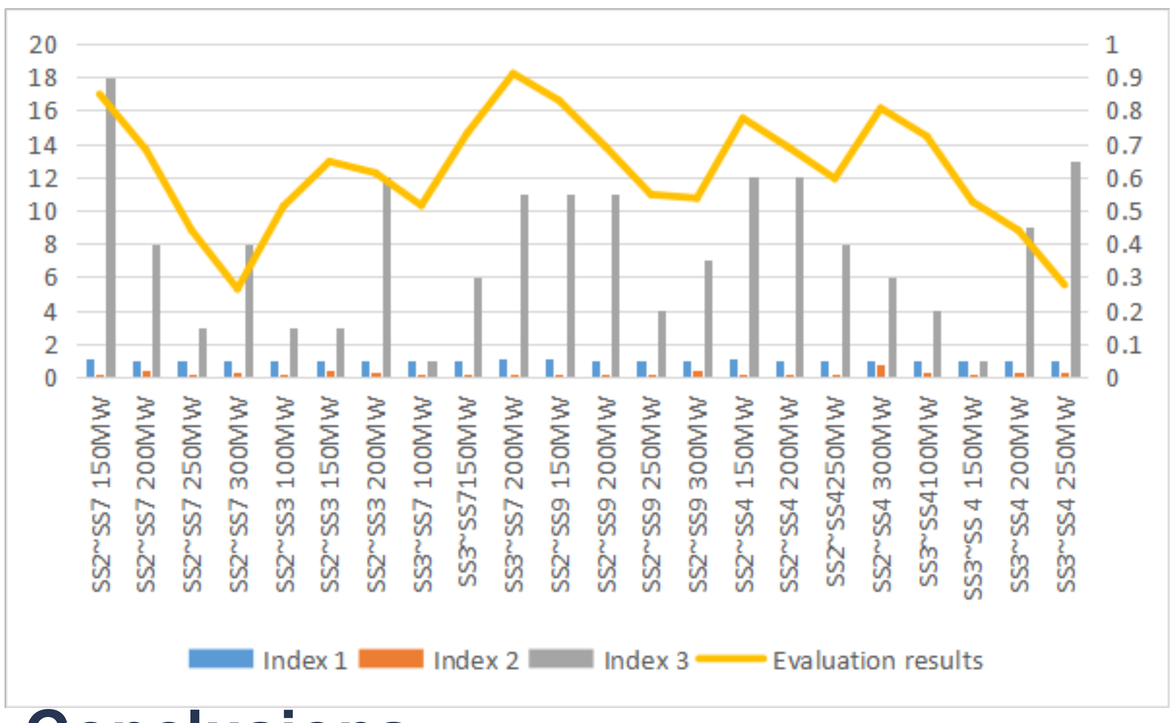
The capacity is relevent to the cost

$$C_1 = 1000C' \times S$$

Case Study & Results



Line circuit	Controlled power flow (MW)			
SS2~SS7	150	200	250	300
SS2~SS3	100	150	200	
SS3~SS7	100	150	200	
SS2~SS9	150	200	250	300
SS2~SS4	150	200	250	300
SS3~SS4	100	150	200	250



Conclusions

Based on the simulation, it is confirmed that the model is effective, and the real results are obtained: UPFC has excellent power flow regulation ability.