

Analysis on the Operation Strategy of the 220kV External Transmission Channel for the Nujiang Power Grid after the Installation of Series Compensation

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Abstract. In recent years, Nujiang Prefecture vigorously develop hydropower, the grid structure in the northwest of Yunnan Province is not perfect, which leads to the research and construction of the power grid lags behind the development of the hydropower. In 2015, the company in view of the nu river hydropower dilemma decided to change outside the nu river to send out a passage with series compensation device in order to improve the transmission capacity, the company to the main problems related to the system plan, but not too much in the region distribution network and detailed study. Nujiang power grid has unique structure and properties of the nujiang power grid after respectively, a whole rack respectively into two parts, namely power delivery channels, load power supply, the whole grid occurred fundamental changes, the original strategy of power network is not applicable, especially noteworthy is the main failure after network of independent operation problem, how to avoid the local series, emergency problem is more urgent, very tolerance test area power grid, this paper aims at the analysis of existing data, simulation, provide a reference for respectively after the operation for the stable operation of the power grid.

1. Introduction

By the end of 2015, the installed capacity of small and medium hydropower plants in Nujiang had exceeded 1 million 300 thousand kilowatts [1]. It was restricted by the local multi clock factors. The power supply, sale and transmission imbalances were blocked, and the power supply was about 500 thousand kilowatts [2]. Expected by the end of 2017 Nujiang power grid in the wet period will take grid respectively operation, and a small local network and the main weak link operation mode, implement the goal of increasing regional power transmission; then Nujiang grid overall grid structure will be a fundamental change in operation after 110kV, 35kV network will have great impact in the Nujiang network [3]; There are many problems such as dynamic stability, transient stability and high voltage etc. Considering the maintenance of N-1 and N-2^[4], the operation of the power grid is more risky. After the grid is respectively running, the dilemma of the grid itself will still exist, as the grid and operating



characteristics change with the new problems of intertwined more exacerbated the difficulties and risks of regional power grid operation, such as high voltage, part of the transmission line, etc. [5,6], need to re-sort and take the appropriate strategy. Nujiang power grid of the separation of the operation to increase the power of delivery at the same time, also led to a number of local problems more prominent, the overall operation of the strategy is not suited to the whole network of operational risk points, weaknesses and the corresponding device needs to re-sort and make adaptive adjustment, and make cutting-edge research and analysis. In addition, the adaptability analysis and grid optimization, the stability control device and the protection configuration adjustment, the overall risk assessment, the stability of the isolated network after the fault also need to be systematically concerned [7].

2. General situation analysis on respectively operation of Nujiang power grid

2017 years before the wet period, the Nujiang power transmission channel series will be completed and put into production, when the regional power grid will be divided into two parts of the operation, part of the regional load operation network, the other part of the surplus power transmission large channel, two part of the weak link through the single line constitutes a power network, the grid operation of the existence of a greater risk. In the preliminary stage of the project, more consideration is given to the relevant aspects of the main network in northwestern Yunnan and the regional grid operation related to the Nujiang River network, there is no specific strategy for the safe and stable operation of the regional power grid. Through the collection of pre-data, will systematically comb the problems and risk points after the respectively operation of the grid, for the emergence of new issues and some of the original problems superimposed on the derivative problem, given the initial solutions, the research problems are run respectively after stability control device adjustment and stability control strategy, a more prominent voltage the limit delivery equipment failure caused by the stable running of grid maintenance, operation mode and risk control etc.

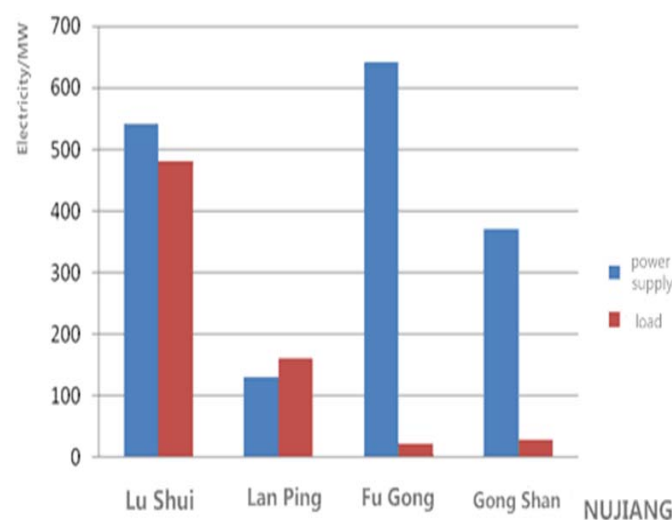


Figure 1 The power supply of four counties in Nu River area is in line with the balance

2.1. The block power supply mode after respectively operation

The four counties of Nujiang are limited by geographical location, resources human development and other factors, the power balance of between the counties is quite different, Fugong, Gongshan two counties hydropower development faster power installed capacity, and the load is small and have 35kV system power supply, economic development continued to slow, and Lan Ping is just the opposite, Lanping industry more the power consumption is large, but less and less installed, can not achieve self-balancing, Lushui is relatively good, , the load and power can basically balance, 2015 Nujiang four

county power and load balance as shown in Figure 1. By early 2016, the Nujiang power grid within the jurisdiction of the 220kV substation 4, 220kV hydropower station 1, 110kV substation (switch station) 20, 35kV substation 31, ground adjustable power plant 86, constitute the basic grid of Nujiang power grid. According to the preliminary feasibility study and preliminary assumptions, Nujiang power grid after the grid layout shown in Figure 1.

2.2. Analysis of independent network operation after fault

According to the preliminary feasibility study plan, the four counties of Nujiang are constructing self-balancing system respectively. When the main network faults, the control device disconnects the weak connection between the regional load operation network and the surplus power transmission network, and then forms the independent power grid (Gongshan power grid, Fugong power grid, Lanping power grid, Lushui power grid is not directly connected with the delivery channel, temporarily not analyzed). The stable operation of the independent network involves voltage stability and frequency stability. The key to stable operation is the matching degree of power supply and load and the tolerance of the power grid itself.

Voltage stability in independent network operation

According to the system standard, the substation operating voltage is generally 1 ~ 1.1 times the rated voltage, the maximum daily, small load voltage fluctuations should not exceed 10%. Through the statistical analysis of the substation of Nujiang Power Grid, it is necessary to take measures such as throwing the reactive power compensation device, adjusting the transformer tap and the operation mode of the unit, so as to ensure the voltage meets the requirements.

Frequency stability in independent network operation

The frequency stability of the system requires that the system frequency recover quickly to 49.2~50.5 after the accident, the simulation results show that the system load is transient stable from the highest load to the minimum load in 10s, the system frequency is normal, and the operating frequency curve of the isolated network in Gongshan area is shown in Fig2.

Risk analysis of independent network operation

According to the relevant provisions of the network, and the provincial company ,here only to discuss the independent network instability, surplus power ,transmission channel failure two cases. Nujiang power grid belongs to the municipal power grid, Gongshan, Fugong and Lanping power supply load belongs to the residents load and industrial load, no significant load, so the resulting accident event level is highest for the secondary event.



Figure 2 The operating frequency curve of Gongshan area

3. Problems in the respectively operation of Nujiang power grid

Nujiang Power Grid has experienced the Nujiang local power grid company, Nujiang Power Supply Bureau and the subsequent integration into the new Nujiang Power Supply Bureau of the management, construction, development ideas caused by differences in power grid construction is not balanced, power grid planning unreasonable, etc., coupled with the Nujiang terrain restrictions Is to reduce the reliability of power supply, increased network loss and so on.

Nujiang territory, the overall industrial level is lagging behind, large electricity load is mainly concentrated in the Lushui, Lan Ping, Gongshan, Fugong almost no high energy-consuming industries, Nujiang overall population base is small, the people load is less, with this phase Comparison, the power supply of the Nu River is mainly concentrated in the Lushui, Fugong, Gongshan, resulting in Fugong, Gongshan two counties power matching contradictions, which also indirectly affect the two counties of the power distribution strategy. In addition, after the grid is respectively operation , the fluctuation of the voltage and other parameters will be more obvious.

4. Conclusion and suggestion

Through the analysis of some prominent problems after the installation of the fixed series compensation in the outer delivery channel of Nujiang network after the grid respectively operation , the following conclusions and suggestions can be obtained:

1) Nujiang outbound channel installation of fixed series compensation, the voltage will have a certain increase in the network, when the voltage is high and stable this phenomenon will become increasingly prominent, the need to Nujiang power grid operation mode, equipment operation mode adaptively adjusted.

2) Nujiang power grid independent operation, reliability of three county power Gongshan, Fugong, Lanping undergo large test, normal operation by weak links with grid connected, but the delivery of surplus power network fault or grid fault condition, must ensure the protection and safe device to cooperate effectively cut off the weak links, to ensure the stable operation of three independent network.

3) Nujiang power grid is about to transition to the control of integrated control mode, the original grid control mode changes, combined with the implementation of the Nujiang outbound channel series compensation project, exacerbated the risk of grid operation, it is recommended to systematically sort the grid data, the network operation unit of layered machine network coordination test, to ensure the stable operation of power grid fault condition.

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