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ABOUT MODELLING OF A CURRENT MODE OF ULTRAHIGH VOLTAGE AIR-LINE

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For air-lines (AL) of ultrahigh voltage (UHV) the big extent, considerable transferred capacity, presence of devices for increase in transferred reactive are characteristic. Depending on appointment of a constructed electricity transmission its so-called throughput, this that greatest reactive which taking into account all limiting factors it is possible to transfer on a line gets out.

To rise transferred reactive of lines of transfers it is possible, increasing voltage of a line or reducing wave resistance of lines of an alternating current. The last in a certain measure can be reached a corresponding design of an electricity transmission of an alternating current. The special actions directed on change of parameters of a line of an alternating current (inductive resistance and capacitor conductivity) which are called as indemnification of parameters of a line are besides, provided.

Questions of modeling of modes of an air-line ultrahigh voltage by measurement of parameters of modes AL 500 kV «Apsheron-2» on the basis of the measuring -computing system and the personal computer are considered. Results of the analysis of optimum parameters of a mode for increase of technical and economic efficiency of operation are resulted.

In Azerbaijan Scientific-Research and Designed-Prospecting Institute of Energetic researches on measurement and the analysis of making reactive and energy losses and also indicators of quality of electric energy AL 500 kV Apsheron-2 were carried out. For measurement of parameters AL of a high voltage 500 kV the measuring -computer complex «SIMEAS Q» firms "Siemens" has been used.

The registrar of quality measures frequency, active, reactive and full reactive, a power factor, voltage, a fliker dose, 1-40 - the voltage and current harmonics, full harmonious distortion, active energy - import and export, reactive - inductive both capacitor energy and full energy of system. Measured sizes are besides, calculated: capacities, cos φ, a fliker dose, harmonics, etc. These values remain in memory of the device, including the information on time.

Time of averaging of parameters of measurement «SIMEAS Q» makes 1-3600 sec. Time of measurement of deviations from the set limits is set from 10 мс to 3600.

Devices and computers on ends AL have been synchronized on time. The first system of measurement of parameters of a mode has been established in the line beginning «Apsheron-2» 500 kV (fig. 1) on substation «Azerbaijan TPS» 500\330 kV, and the second system of measurement in the end of a line on substation "Apsheron-500\330\220 kV ".

The measuring-computer complex «SIMEAS Q» has been connected under the two-element scheme of connection of the device to secondary chains of measuring transformers of a current and voltage.

Six series of experiences have been spent. Measurements of parameters of a mode were carried out 17-21.02.2008 with use «SIMEAS Q» directly on AL 500 kV «2Apsheron» at different modes and time of averaging of parameters of a mode 1 sec and 10 sec, 1, 5 and 10 minutes.

Experiments have been planned for the period when under forecasts different weather conditions on a zone of passage AL 500 kV Shamakhi - Agsu - Gebele - Geokchay - Mingechaur were expected. During carrying out of measurements different weather conditions, such as good weather, a fog, a rain and snow were observed.

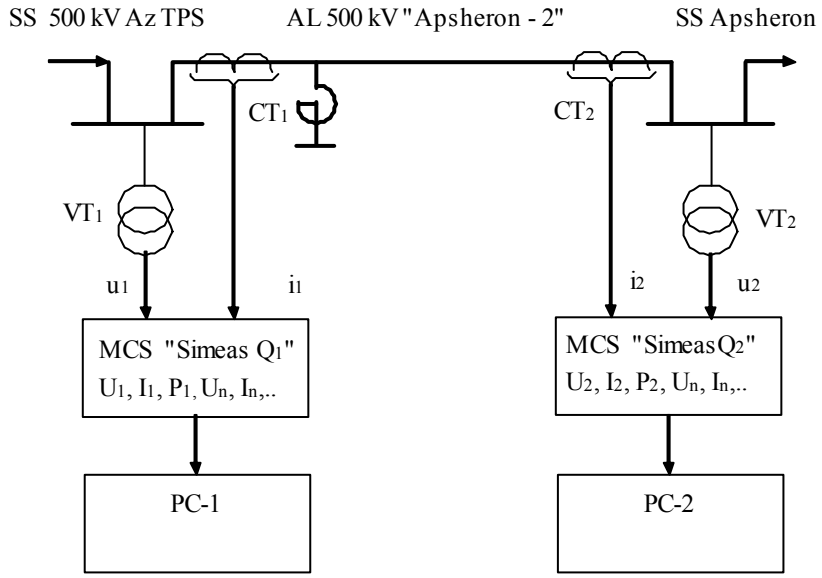

Fig. 1. AL 500 kV "Apsheron-2" mode parameters measurement scheme

Growth of harmonics of voltage and current has been registered at increase of losses on a crown.

Schedules of active capacities in the beginning and end AL 500 kV «Apsheron-2» on measurements 20.02.2008 years for days at time of averaging of 10 minutes are resulted on fig 2.

Losses of reactive AL consist of losses on heating of wires - $\Delta P_н$, losses on a crown - $\Delta P_к$, losses from leak currents in insulators - $\Delta P_{из}$. The difference of active powers in the beginning and the line end makes losses of active reactive in AL 500 sq.

$$\Delta P_{\Sigma ВЛ} = P_1 - P_2 - \Pi_P$$
$$\Delta P_{\Sigma ВЛ} = \Delta P_н + \Delta P_к + \Delta P_{из}$$

Results of measurements show, that on AL 500 kV «Apsheron-2» are transferred the big reactive capacities (150□300 MVAr) which are not optimum on conditions of operation AL UHV. It testifies to deficiency of reactive reactive in region Apsheron.

Voltage schedules in the beginning and end AL 500 kV «Apsheron-2» on measurements 20.02.2008 years for days have been processed at time of averaging of 10 minutes. Voltage in the end of AL 500 kV «Apsheron-2» depending on transferred in the area of reactive varies within 498 □ 508 kV, and in the end of transfer within 435 □ 460 sq. Power failure varies within 45 □ 65 kV, that makes approximately 9□13 % nominal, that it is more than maximum permissible values (-10 than %).

Modes AL 500 kV «Apsheron-2» transfers of active reactive 450 corresponding to actual modes, 500, 550, 600, 650 MW by the task of active and reactive (P_2 and Q_2) in the end of transfer are simulated. Losses on crowns of wires for different weather conditions were modulated testimonials from of voltage of 4-8 degrees. The modeling of modes corresponding actual and optimum, is made also under programs Azerbaijan Scientific – Research and Designed-Prospecting Institute of Energetics

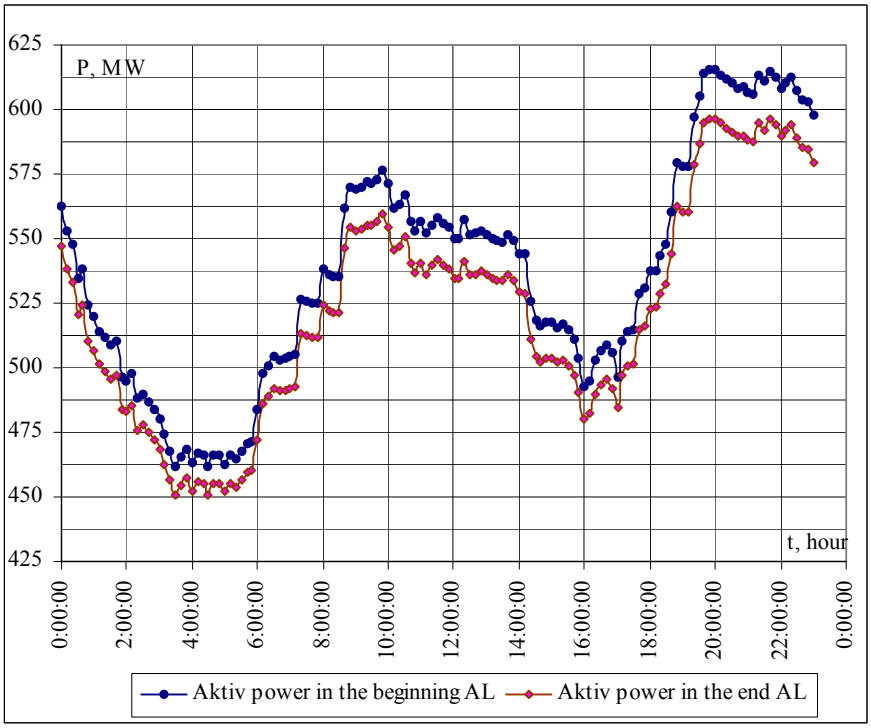

Fig. 2. The schedule of active power in the beginning
and end AL 500 kV 2 Apsheron.

The effect from decrease in losses of energy at operation ЛЭП 500 kV Apsheron-2 in an optimum mode is defined under the formula

$$\Delta\Delta W = \Delta W_{и} - \Delta W_{0},$$

where $\Delta W_{и}$ ΔW_{0} - electric power losses in an optimum mode accordingly.

Results of calculation of losses of reactive for AL UHV «Apsheron-2» according to the spent measurements and optimization of a mode depending on transferred reactive are resulted in the table.

Table. Effect of decrease power losses in dependence from transferred power.

mode №	Power in the end of AL P_2, MW	Total power losses of AL AL, MW			
		Aktual mode	Optimal mode	Effect of decrease in	
				MW	%
1	450	9.18	6.39	2.79	30.39
2	500	10.80	7.67	3.13	28.98
3	550	13.57	9.10	4.47	32.94
4	600	16.55	10.66	5.89	35.59
5	650	18.94	12.36	6.58	34.74

Thus, the settlement effect from decrease in losses of reactive depending on transferred reactive 450-650 МВт varies within 2.79 - 6.58 МВт. Economic benefit of decrease in losses of energy for a year $\Delta W = 4*10^3*8760=35*10^6$ kVт.hour. At the rate of costs of losses ЭЭ of equal cost of wholesale realization of the electric power 4 manat/kVт*hour, we receive economic benefit for a year $\Delta C = 35*106*4 = 143600$ manat.

CONCLUSION

Experimental researches on measurement of parameters of mode AL 500 kV Apsheron-2 are spent. Operation in an optimum mode leads to increase of throughput of transfer to limiting value on active reactive.

Maintenance of optimum modes allows decrease in losses of reactive on 5 □ 7 МВт and energy losses on 35 million kVт*hour for a year, that in turn leads to essential increase of profitability of operation power system of Azerbaijan.

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