

COMPENSATION OF REACTIVE POWER ON WIND-ELECTRIC POWER STATIONS

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The operating experience of wind farms (wind farms) showed that when the stations operate in full or peak generation, two polar phenomena occur simultaneously:

- increase in voltage on the tires of asynchronous generators (AG) along the side of 0.4 kV;- an increase in the consumption of reactive power from the electric network, with fully turned on compensation devices for each wind turbine (WEC).

The considered wind turbines are equipped with AG, which, when producing active electricity, consume reactive (electromagnetic) energy from the network. This leads to an increase in active energy losses in the network. In part, this need for reactive power to form the fields of the machine is covered by capacitor banks installed on the units, however, as experience in the operation of industrial wind farms shows, the latter in most wind regimes manifest themselves as consumers of reactive power on a significant scale. In some cases (when a wind turbine is operating with a power of 40% of the nominal), reactive energy is released into the electric network due to the inclusion of capacitor banks installed on the wind turbine. However, it is difficult to use this energy (to improve the technical and economic indicators of the network) due to the unpredictability of wind regimes. The main electrical circuits of the wind farm are built on a modular principle - USW 56-100 wind turbines (with AG) produce electrical energy at a voltage of 0.38 kV to a transformer point (TP), where the wind turbine groups, in the amount of from 6 to 17 units are connected to one step-up transformer TP respectively 630, 1000 or 1600 kVA. Depending on the nature of the surrounding networks, the voltage on the upper side of the transformer transformer is 10 or 35 kV. For all existing wind farms with AG, the electric grid enterprises issue technical specifications requiring zero flow of reactive electricity at the point of connection of the wind farm. To ensure zero flow of reactive electricity into the external network, compensation devices should be installed at the points of connection to the busbars of the reference transformer substations. It is possible to formulate requirements for compensation of the reactive power consumed by the AG-mi of wind power plants: the wind farm must self-balance by reactive power, while maintaining a "zero" flow of reactive energy consumption-generation. Since such requirements arose only after 1997, the wind farm projects implemented earlier did not contain circuit-technical and structural solutions to maintain a zero reactive power balance. It has been established that when the wind speed is less than the initial boundary of the wind turbine operating range, the consumers of reactive power are the elements of the wind farm electric network - mainly TP power transformers.