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Project planning conception for the Norilsk-Taimyr AC network - Tyumen power grid

HVDC and Power Electronic technology and developments
System Development and Economic

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Norilsk-Taimyr AC network is located in the Russia's Far North on the Taimyr half island. At the present time there are no electrical interconnection between Norilsk - Taimyr AC network and unified power system of Russia.

The majority of the generation in Norilsk-Taimyr AC network is from hydroelectric power stations, which determines the dependence of energy balance on the water conditions. Upon the low water conditions energy shortage is estimated at about 200 MW in 2020 year. The aging of the electric system infra-structure increases the risk of technological failures and power supply interruption. The main consumers are metallurgical industry. Key feature are location in the climate zone of the Far North, high wind speed, the perpetually frozen soil.

One of the considered measures for increasing reliability of energy supply of Norilsk-Taimyr AC network is to construct interconnection connecting Tyumen power system (part of Russia's unified power system) and Norilsk-Taimyr AC network by 2020.

To realize this interconnection HVDC technology is considered.

HVDC allows to control active power flow, including reverse of power at high water when peak generating capacity in Norilsk-Taimyr AC network.

Taking into account the future power supply and demand, it was found that a capacity 200 MW is necessary to carry the power exchanges between the two systems. Studies have been performed to substantiate the choice of the scheme of link and the transmission rout from the point of view of optimizing the cost and securing the desired reliability.

During this stage of study simulations were circumscribed to load-flow and stability analysis.

Optimum system voltage and conductor have been chosen in order to minimize the overall cost of transmission, power losses, taking into account the technical limits defined for

maximum conductor temperature and corona effects. Basic design of converter stations was made.

Definition of OHTL main characteristics (insulating air clearance, ground spacing, insulator strings, conductors, ground-wire cable, lightning protection) was made. An assessment of the impact of the overhead line on the environment was made.

Capital costs were estimated for the proposed transmission route, design of transmission line and converter stations.

The AC interconnection option was analyzed. The analysis of the advantages and disadvantages of the proposed option HVDC interconnection compared with AC option, taking into account technical and economic factors and reliability is given.