



MAGNETICALLY CONTROLLED SHUNT REACTOR USE IN 110-500 KV POWER GRIDS

PS2-2/Q 2.3

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Comparison of basic characteristics of MCSR, SVC, STATCOM

Characteristics and function	MCSR	SVC	STATCOM
Semiconductor	Thyristors (control system power is 2-3% of the nominal power)	Thyristors	IGBTs
Reactive power output	Inductive (capacitor batteries are required to ensure capacitive output)	Different capacitive and inductive	Equal capacitive and inductive
Speed of response	0.1 s	20-30 ms	<10ms
Fast power control in order to maintain stability during faults	No	Yes	Yes
Losses	0.6-0.5 %	0.4-0.6%	1-1,5%
Space requirements	Smaller than STATCOM	Large (reactor, capacitor)	Smaller than SVC
Cost, \$/kvar	~40	80-100	100-130
Harmonics	Low (no filters required)	Filters required	Low (no filters required)

The reasons for slow uptake STATCOM technology in power system of Russian Federation

- Magnetically controlled shunt reactors (MCSR) are widely used in the electric energy systems of Russia, especially in the 330-500 kV substations and power lines to control reactive power consumption and voltage. The only one STATCOM ± 50 Mvar is installed at Vyborg converter substation.
- STATCOM based on IGBT transistors is relatively expensive and has big power losses in comparison with MCSR and SVC.
- STATCOM equipment has high maintenance costs, high cost of ownership compared with MCSR equipment.

For speed up of adoption of STATCOM it is necessary:

- Further improvements in reliability of control systems and valve units of STATCOM. Forming of failure statistics.
- Simplification of maintenance and cost reduction of ownership of STATCOM equipment.

«Exemplary» cases for MCSR

«Exemplary» case for MCSR application is use it as part of extensive intersystem transmission lines of 330, 500 kV. For example, MCSRs 180 MVA are installed at 18 transmission substation 500 kV in Far East, Siberia and Kazakhstan power grids.

500 kV, 180 MVA MCSR data

Rated voltage	525 kV
Rated reactive power	180 MVA
Power variation range	1...240 MVA
Time constant	0.1 s
Power losses	
• no load operation	200 kW
• rated value	900 kW
Control system rated power	5.4 MW
Current harmonic content	≤ 3%
Weight	3×170 tons

500 kV, 180 MVA MCSR

