



## Nokian Capacitors enters the Chinese market with a delivery of series capacitor banks to Beijing

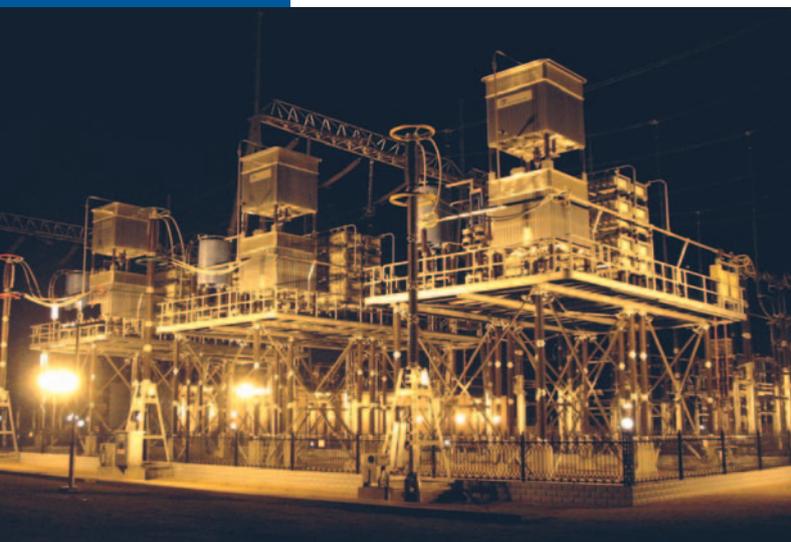
Nokian Capacitors has delivered 444 Mvar/500kV Series Capacitor Banks to North China Power Group to increase power transmission capability. The capacitor banks were installed in the Wanguan-Shunyi transmission line in the Zhangjiakou area.

While China's main sources of energy are to be found in the central part of the country, the consumption of electricity grows fastest in the coastal areas. In Beijing, for example, annual growth in energy usage is 1,000 MW and the 2008 Olympics will only increase consumption. The new series capacitors provide a 50 % degree of compensation and will eliminate the need for new transmission lines. For the project, Nokian Capacitors performed seismic analysis tests to simulate future potential earthquakes in the area.

Our entry to the Chinese market was the result of a tight bidding procedure. North China Power Group found our tender competitive both in price and high technical quality. The project started in June 2002 and was completed on schedule, in spite of the SARS epidemic during the installation time. Thanks to North China Power Group's strong expertise, the work proceeded smoothly and everything was completed within the 12 months allotted.

The equipment was assembled together with a local company, who was the excavation contractor in the project. Nokian Capacitors supervised the assembly and was in charge of the start-up and testing of the equipment.

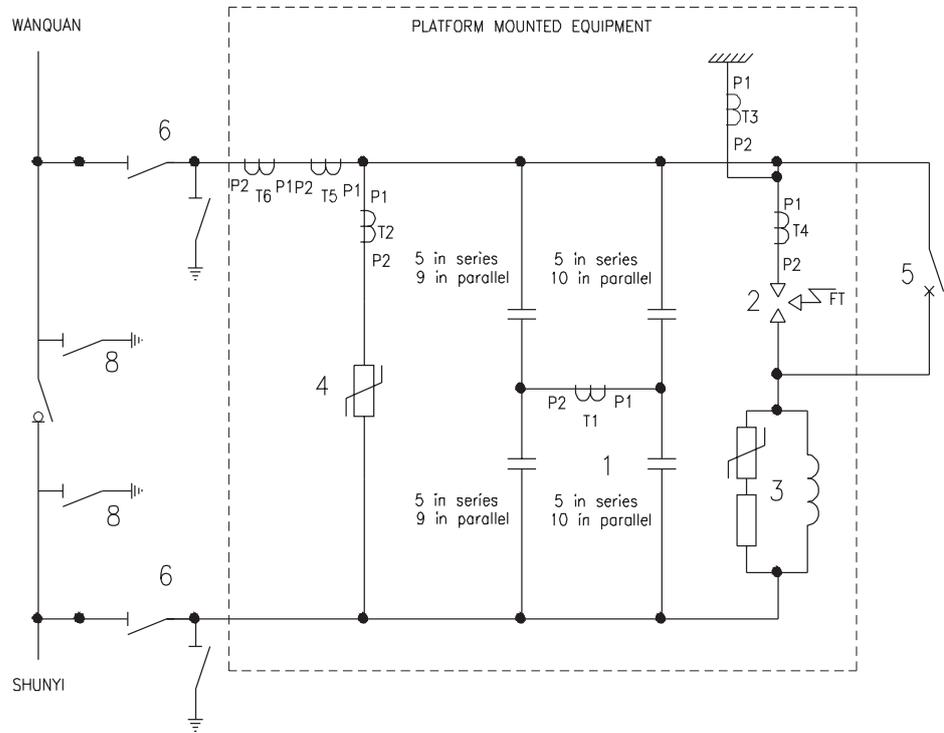
After 12 months in operation, the failure rate of the Shunyi Series Capacitor Banks has proved nonexistent. North China Power Group has reported its satisfaction with the advanced technology of the control system. In its feedback, the customer praises our flexibility, service and high-quality performance.



### TECHNICAL DATA

|   |   |
|---|---|
| Rated voltage:  | 500 kV  |
| Rated current:  | 2400 A  |
| Rated power:  | 444,1 Mvar                                    |
| Degree of compensation:   | 45 %  |
| Rated frequency:  | 50 Hz   |
| Spark gap:  | forced triggered, non-self extinguishing      |
| Damping circuit:  | reactor 0.8 mH/ 2400 A,                       |
| Resistor:   | 5 ohm/ 5.3 MJ<br>(two consecutive discharges) |
| 55-MJ metal-oxide varistor (MOV) bank consisting of varistor units connected in parallel with protective level<br>2.3 pu = 200.6 kVpeak |   |
| Bypass breaker:   | SF6, breaker head 123 kV                      |
| Redundant protection and control systems including Substation and Remote Control systems  |   |

## Wanquan-Shunyi single line diagram



### I MAIN EQUIPMENT:

- 1 Capacitors 10 in series, 10+9 in parallel
- 2 Spark gap
- 3 Damping circuit
- 4 Non-linear resistor
- 5 Bypass switch
- 6 Isolating disconnector
- 8 Line earthing switch

### II CURRENT TRANSFORMERS:

- T1 Capacitor unbalance CT
- T2 Non-linear resistor CT
- T3 Fault-to-platform CT
- T4 Spark gap CT
- T5 Line current CT
- T6 Platform power supply CT

FT Forced trigger command from protection and control