

## SHORT-CIRCUIT TESTS

### HIGH VOLTAGE POWER STATION

The High Power Station is supplied by the 400 kV national grid. Two-phase short-circuit power can reach 3300 MVA for voltages ranging from 11,8 kV to 420 kV.

The theoretical maximum short-circuit current is 195 kA, and 130 kA has been already achieved.

An enclosed facility (H 31.2 m, L 32.8 m, l 20.8 m) and four outdoor test areas have been designed for testing the following equipment:

- circuit-breakers, switches, disconnecting switches (safety equipment),
- power transformers, measurement transformers and all equipment containing windings,
- substation and overhead line equipment,
- insulator strings,
- buried cables, and cables laying in ducts.



These facilities are used for performing:

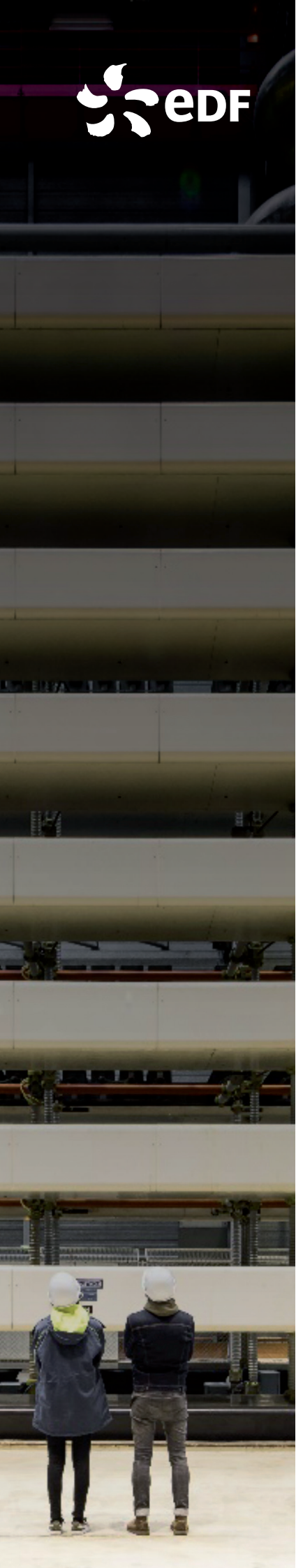
- making and breaking tests : capacitive or inductive current switching tests, short-line fault tests, magnetizing current tests,
- short-time withstand current and peak withstand current tests,
- maintained arc fault tests



Below a certain power level, the breaking capacity of circuit breakers is generally verified by direct testing. Above this level, synthetic test methods are used. The Weil-Dobke type current injection diagram described in publication CEI 60271-101 was chosen for this testing facility, so that it is possible to perform most of the tests specified in international standards (IEC, ANSI), including electrical endurance tests, with setting of a two or four parameter transient recovery voltage, short-line fault tests, terminal fault tests, out-of-phase fault tests. The high power testing station also simulates capacitive current switching tests.

During the tests, electrical and, if needed, mechanical data (force, acceleration, pressure, vibration) are recorded.

Phenomena are also filmed with a high-speed camera (5000 frames/s).



## SHORT-CIRCUIT TESTS

### MEDIUM VOLTAGE POWER STATION



The High Power Station for Distribution Network performs high current tests (up to 500 MVA) on three-phase equipment, rated from 3kV to 24 kV, including:

- Circuit-breakers, switches, disconnecting switches, fuses and safety equipment, surge arrestors
- Transformers and other equipment containing windings
- AC/DC converters.



The tests performed principally include:

- Short-circuit current switching tests,
- Cos variable current load switching tests,
- Capacitive load switching tests,
- short-time withstand current and peak withstand current tests,
- internal arc fault tests,
- Temperature rise tests, mechanical endurance, noise level measurements.

Specific test cells have been fitted out to perform:

- Temperature rise test from ambient temperature up to 55 °C with uninterrupted currents ranging from 50 A to 3 kA,
- Noise measurement of power transformer : background noise in the room is around 18 dB(A). Measurement equipment is mobile so that it is possible to perform tests outside,
- Measurements of no-load or short-circuit losses, inter-turn voltage test at 200 Hz,
- Mechanical tests on switchgears, like mechanical endurance, dimensional measurement,
- Functional control, verification of degrees of protection.

The station comprises two bays supplied by a three-phase circuit, equipped with two 250 MVA short-circuit power transformers, directly connected to the 225 kV national grid. Additional circuits are used for three-phase switching tests, including:

- Capacitor banks up to 450 A,
- No-load cables and no-load transformers devices under 24 kV,
- Mainly active load current devices under 24 kV.

