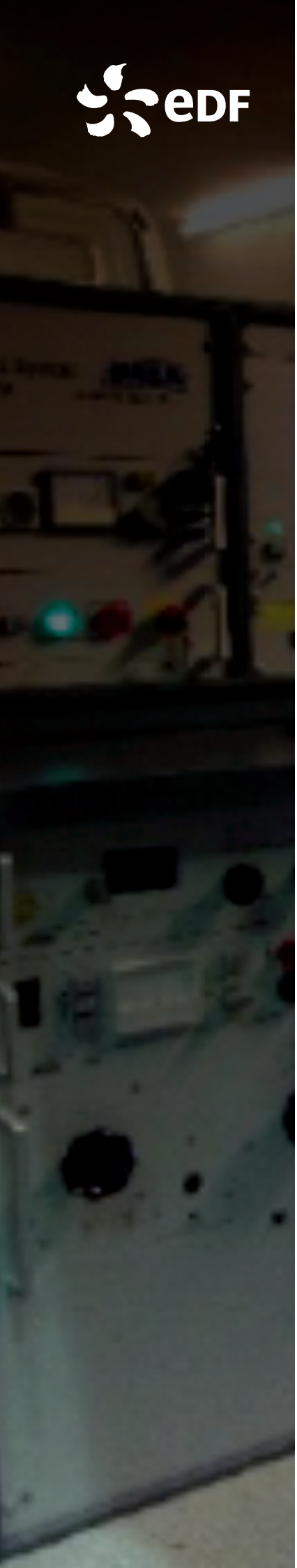


EDF POWER NETWORKS LAB

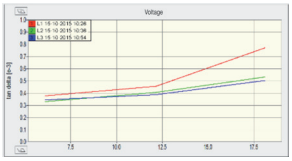
ON SITE DIAGNOSTIC

The laboratories are equipped with mobile equipment for preventive electrical diagnosis

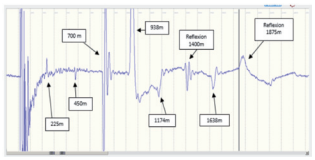
to control MV power lines on site, which belongs to Enedis. This equipment is able to perform electrical commissioning tests on power lines after installation. It also permits to control operating cables and identify those showing potential risks in order to anticipate and schedule the replacement of a part or the totality of the link. The diagnosis and measurement is performed on the line disconnected from the network (off-line measurement). The line is energized with medium voltage source at low-frequency (0.1 Hz).

Two types of measurements are carried out:

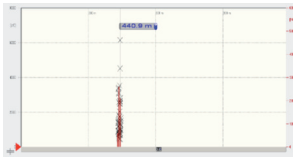
The tangent delta measurement makes the identification of significant dielectric losses possible by measuring the leakage current when applying a very low frequency voltage (typically 0.1 Hz). It is mainly used to evaluate the impact of a degradation process due to moisture penetration into the insulation. The tangent delta measurement gives information on the entire line. It does not allow the localization of the weak point on the line. Also, it does not locate the humidity section but only determine its existence and how important it can be according to the cable studied. On the other hand, the measurement has the advantage of being independent of length of the line when it is homogeneous (same type of insulation over the entire length of the link).



Delta TAN Measurement :
Detection of the decrease in isolation of a power line



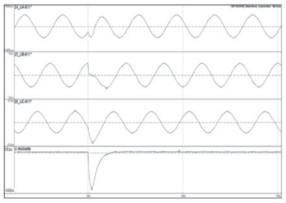
Partial discharges :
Localization of a weak point on a power line



Reflectometry :
Localization of impedance variations

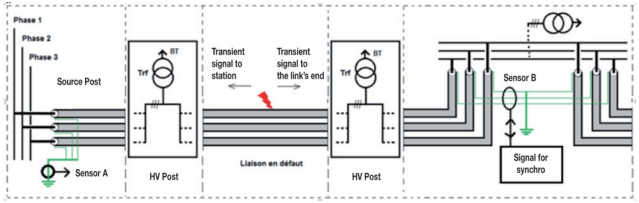
The partial discharges measurement allows the detection and localization of micro breakdowns which occur in a fraction of the insulation that no longer supports the applied electric field. The identification of cable areas that are subjected to particularly high electric field stresses is possible due to this equipment. It is mainly used to identify areas where micro-initiation produces an important alteration (erosion or carbonization of the insulation). The location is obtained by measuring the propagation time of the pulses along the line (TDR-Time domain reflectometry).

Pre weak point phenomenon



3 main voltage of the network
Residual voltage

Principle of detection and localization of a weak point



Measurement at points A and B with synchronization solution

Furthermore it is also possible to carry out measurements in HV substations for the detection of transient phenomena to prevent interruptions during operations.

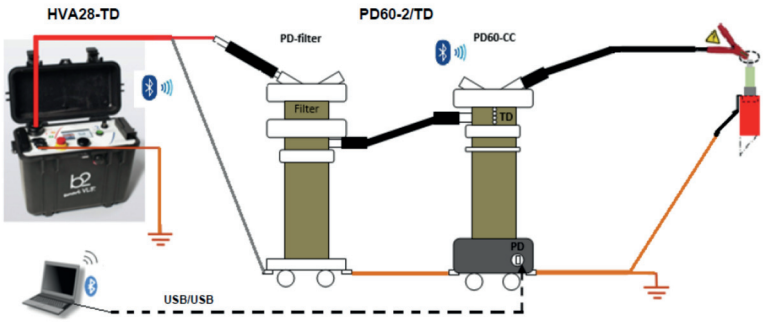
In addition, our teams are able to implement and set up phasor measurement units on HV circuit-breakers to allow the lifetime extension of the power transformer of power-plant.

EDF POWER NETWORKS LAB

ON SITE DIAGNOSTIC

Technical caracteristics:

	GENERATOR	MAX LOAD GENERATOR	EQUIVALENT LENGH MAX CABLE (XLPE)	TD MESURE	DP MESURE	COMMENTS
BAUR Trailer (PHG546TD/PD)	DC ± 54 kV 70 mA AC 36 kV m/s ~0,01 Hz à 0,1 Hz	3 µF@0,1 Hz@36 kV 6 µF@0,1 Hz@18 kV	10 km 20 km	Integrated system 1.10^4 à 1 30 nF à 3 µF Resolution 1.10^{-5} Precision 1.10^{-4}	Integrated system Coupling C=5nF Detection limit 20 pC 100 Ms/s 5000 m. @ 80 m/µs (160 µs max)	Bockmann trailer 1300 kg max
BAUR van (PHG80TD/PD)	DC ± 80 kV 90 mA AC 57 kV m/s ~0,01 Hz à 0,1 H	1 µF@0,1 Hz@57 kV 3 µF@0,1 Hz@36 kV 8 µF@0,1 Hz@18 kV	3,3 km 10 km 26 km	Integrated system 1.10^4 à 1 10 nF à 20 µF (option 0,5 nF-10 nF) Resolution1.10^{-5} Precision 1.10^{-4}	Integrated system Coupling C=5nF Detection limit 20 pC 100 Ms/s 5000 m. @ 80 m/µs (160 µs max)	Renault Master 3000 kg
HVA-TD60	DC ± 60 kV 40 mA AC 44 kV m/s ~0,01 Hz à 0,1 Hz	HVA60 10 µF (1) 1 µF@0,1 Hz@44 kVrms 2,4 µF@0,1 Hz@ 18 kVrms	3,3 km 8 km	TD60 1.10^4 à 1 30 nF à 3 µF Resolution 1.10^{-5} Precision 1.10^{-4} 44 kV rms (0,1Hz)		Generator (57 kg) + TD60 trunk + accessories bag
HVA28-TD (b2)	DC ± 28 kV 20 mA AC 20 kV m/s ~0,01 Hz à 0,1 Hz	10 µF (1) 0,5 µF@0,1 Hz@20 kV 0,55 µF@0,1 Hz@18 kV	1,6 km 1,8 km	Integrated system 1.10^4 à 1 30 nF à 3 µF Resolution 1.10^{-5} Precision 1.10^{-4}		1 Valise (14 kg) + 1 accessories bag (Malette type CNPE)
PD60-2/TD (b2)	None (Used with generator HVA60 ou HVA28)			PD60-TD 1.10^4 à 1 0,5 nF à 10 µF Resolution 1.10^{-5} Precision 1.10^{-4} 44 kV rms (0,1Hz)	PD60-TD Detection limit 10 pC 100 Ms/s 12 800 m. @ 80 m/µs 44 kV rms (0,1Hz)	Packaged 2 trunks



Configuration tan δ (HVA28-TD) and partial discharges (PD30)

EDF R&D
EDF lab les Renardières
Contact :
networks-lab@edf.fr
networks-lab.edf.com