

VOLTAGE QUALITY MONITORING

Audrey Scoffoni - CRE

Jacques Gauthier - ERDF



Workshop

Brussels, 18th November 2009

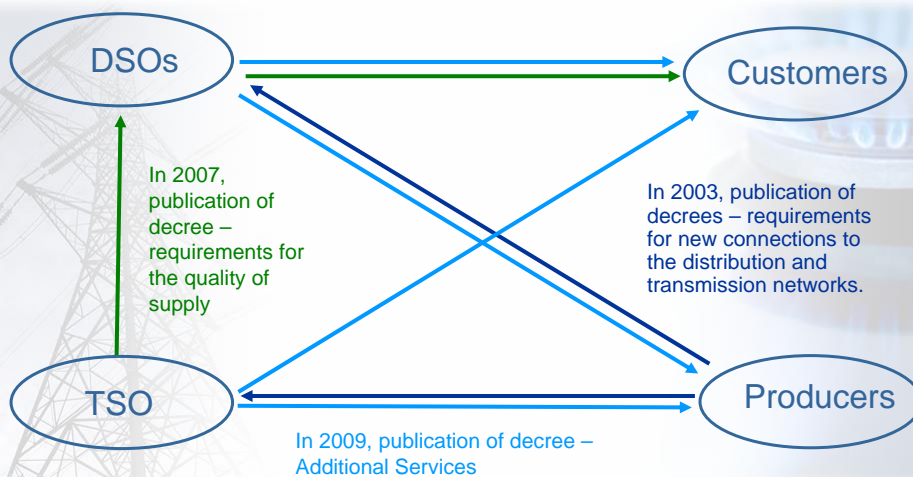
Table

- **Aspects of the role of the French regulatory authority (CRE) / Legal texts**
- **Contractual commitments**
- **Voltage Quality Monitoring (VQM) in the main French DSO**

Some roles of the French regulatory authority (CRE)

- Proposes rates for the use of public electricity grids**
 (art.4 law 10/02/2000)
- Issues a preliminary recommendation on decree like the**
 “quality’s decree” (art.21-1 law 10/02/2000)
 “connection’s decrees” (art.14 & art.18 law 10/02/2000)
- Can be called upon in the case of disputes arising between users and operators of public transmission and electricity distribution grids**
 (art.38 law 10/02/2000)

Decrees – 1/3



Decrees – 2/3

- **In 2003, publication of decrees – requirements for new connections to the distribution and transmission networks.**

Both generation and consumption installations should respect thresholds related to **harmonic currents, flicker, voltage unbalance, rapid voltage changes.**

- **In 2007, publication of decree – requirements for the quality of supply.**

For the distribution networks. only supply voltage variations and continuity of supply are related.

Supply voltage variations (10 min)
 $U_f = U_n \pm 10\%$ (LV & HTA)
(U_n : nominal voltage; U_f : supply voltage)

- **In 2009, publication of decrees – Additional Services.**

For example: **personalized assessment of the continuity, monitoring and analysis of voltage disturbances, etc.**

Table

- **Aspects of the role of the French regulatory authority (CRE) / Legal texts**
- **Contractual commitments**
- **Voltage Quality Monitoring (VQM) in the main French DSO**

Contractual commitments – 1/3

- Since 1992, contractual commitments for HV and MV customer included in “Emeraude” contracts, related to **supply voltage variations, flicker, voltage unbalance, frequency fluctuations, harmonic voltages (only on the global rate)**.
- Currently (since 2003), contractual commitments for HV, MV and LV customer included in “CARD” (for DSOs) or “CART” (for TSO) contracts, related to same power quality parameters

TSO: “CART” (from 63 kV to 400 kV)

DSOs: “CARD” (at 20 kV or less)

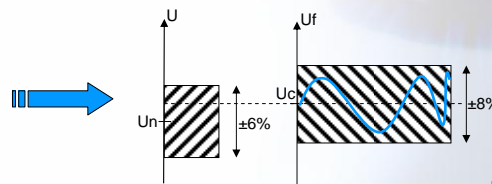
“CARD HTA” (MV: 20 kV and 15 kV)

“CARD BT” (LV: 400 V and 230 V)

contractual commitments – 2/3

Power Quality parameters	CART	CARD HTA	CARD BT
Supply voltage variations (10 min)	63 kV & 90 kV: $U_c = U_n \pm 6\%$ & $U_f = U_c \pm 8\%$		
	150 kV: $U_c = U_n \pm 7\%$ & $U_f = U_c \pm 10\%$	$U_c = U_n \pm 5\%$	$U_f = U_n \pm 10\%$
	225 kV: $200 < U_c < 245 \text{ kV}$ & $200 < U_f < 245 \text{ kV}$	$U_f = U_c \pm 5\%$	
	400 kV: $380 < U_c < 420 \text{ kV}$ & $380 < U_f < 430 \text{ kV}$		

U_n : nominal voltage
 U_c : contractual voltage
 U_f : supply voltage



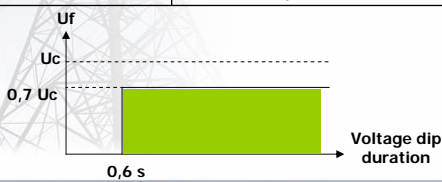
contractual commitments – 3/3

Power Quality parameters	CART	CARD HTA	CARD BT
<i>Flicker</i>	$Plt \leq 1$ (2 h)		
<i>Voltage unbalance</i>	$\tau_{vm} \leq 2 \%$ (10 mn)		
<i>Power Frequency</i> (10 s)	$50 \text{ Hz} \pm 1 \%$ (case of interconnected networks) $50 \text{ Hz} + 4/- 6 \%$ (when operating isolated from the european network)		
<i>Voltage harmonics (indicative values)</i>	$THD \leq 6 \%$ x % for each order	$THD \leq 8 \%$ x % for each order	

Optional contractual commitments

In case of specific needs, customers can benefit from customized commitments Necessary works and customized service are paid by the customer.

Power Quality parameters	CART	CARD HTA	CARD BT
<i>Interruptions</i>	Short interruption: 600 ms <T< 3 min	based on local conditions of supply	
<i>Voltage dips</i>	30% U_c et > 600 ms maximum number of voltage dips per year, based on the historical data of the 4 previous years	30% U_c et > 600 ms maximum number of voltage dips is based on local conditions of supply (not less than 5/year)	



Restricted area for voltage dips commitments (30%, 600 ms)

- **Aspects of the role of the French regulatory authority (CRE) / Legal texts**
- **Contractual commitments**
- **Voltage Quality Monitoring (VQM) in the main French DSO**

- **Quality decree (24/12/2007) - requirements for the quality of supply**
 - MV & LV Supply voltage variations and continuity of supply **are nowadays not monitored**
 - **only statistic models and remote control system are used**
 - **new smart metering experiment with LV monitoring in 2011 (ERDF)**

VQM in the main French DSO checking procedures – 2/3

- “CARD” contracts - contractual commitments MV customers
 - customers having **personalised** (dips, interruptions) PQ contracts
 - systematic **PQ monitoring equipments**
 - customer having **standard** (basic) PQ contracts
 - recovery quality data when it exists (from meter equipments)
 - **no** plan for **systematic** implementation of PQ **monitoring** equipment
 - **migration** at the pace of the existing meter equipment replacement

VQM in the main French DSO checking procedures – 3/3

- VQM on MV busbars in HV/MV substations
 - Our policy of PQ monitoring plans equipment of all MV busbars in HV/MV substations in order to
 - **have macroscopic view of PQ parameters at HV/MV substations**
 - **control contractual commitments at the DSO/TSO interfaces (CART)**

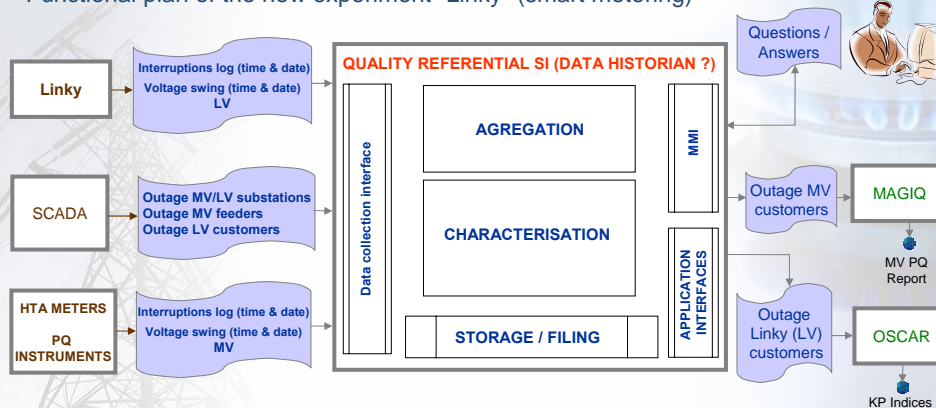
Existing fixed PQM equipments

- **MV busbar in HV/MV substations**
 - ➔ 50% with PQM instruments (Contractual Network Analyzers)
- **MV customer interface**
 - ➔ 1% of all PQ contracts are personalized and 10% of them have PQM instruments
Contractual Network Analyzers
 - ➔ 99% of all PQ contracts are standard (basic) and 20% of them have PQM instruments
Contractual Network Analyzers - quality data from meter equipments
- **Other considerations**
 - ➔ accuracy classification (according IEC 61000-4-30)
 - Class A for Contractual Network Analyzers
 - Class B for quality data from meter equipments
 - ➔ voltage quality data collected are stored in national application MAGIQ



Trend towards a French Quality Referential Data System

Functional plan of the new experiment "Linky" (smart metering)

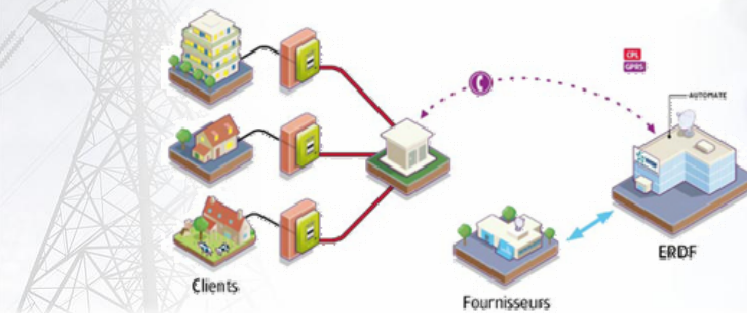


Experiment on 300,000 LV customers ➔ 2011

Possible global implementation of LINKY - all LV customers ➔ end of 2016

Conclusion

- Voltage Quality Monitoring far closer to the customer
→ Smart metering
- New experiments: **Linky**



Thank you for your attention!

www.cre.fr

www.erdf.fr



Power Quality parameters	CART	CARD HTA	CARD BT
<i>Planned interruptions</i>	Terms negotiated	2 planned interruptions par year T < 4 hours	The duration of interruption can be 10 hours but in no case exceed
<i>Unplanned interruptions</i>	based on the historical data of the 4 previous years.	based on local conditions of supply	