

VOLTAGE QUALITY MONITORING

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Workshop

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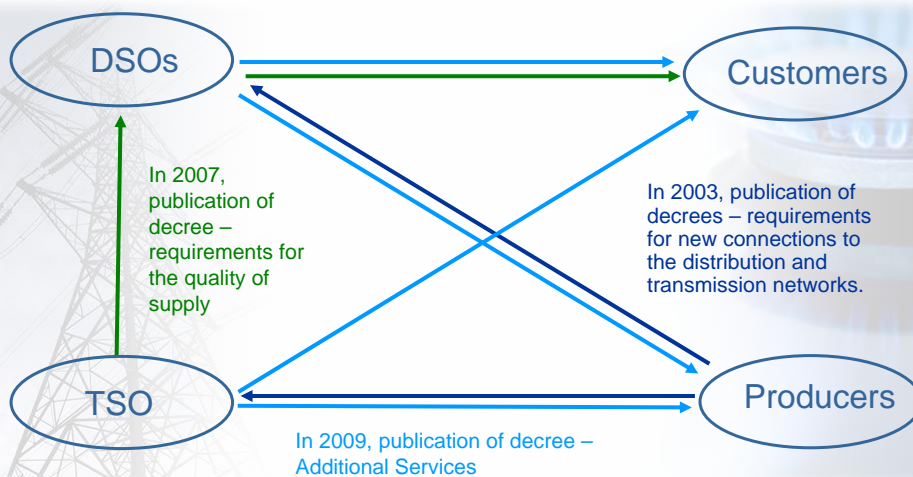
Table

- **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**
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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)

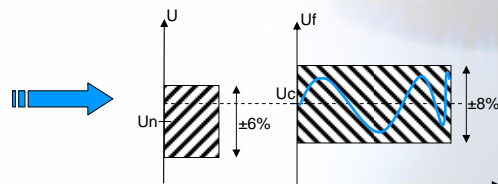
“CARD HTA” (MV: 20 kV and 15 kV)

“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: $200 < U_c < 245$ kV & $200 < U_f < 245$ kV | $U_f = U_c \pm 5\%$ | |
| | 400 kV: $380 < U_c < 420$ kV & $380 < U_f < 430$ kV | | |

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



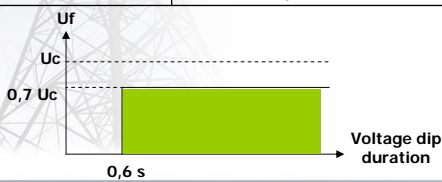
contractual commitments – 3/3

| 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)**

- “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 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)**

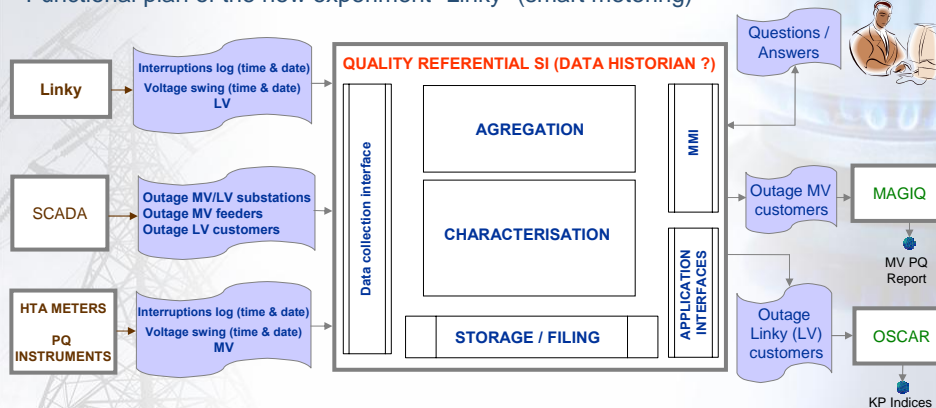
Existing fixed PQM equipments

- **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)

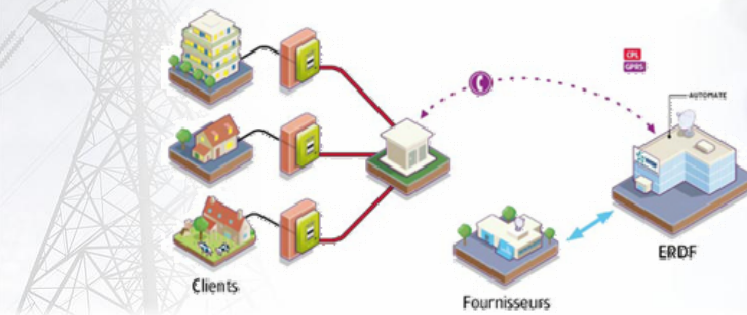


Experiment on 300,000 LV customers ➔ 2011

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 | |