BUYING NETWORK LOSSES ON THE ENERGY MARKETS

Yves FRELON
EDF ERD – France
yves.frelon@edf.fr

Nicolas HERAULT
EDF ERD – France
nicolas.herault@edf.fr

Bruno NITROSSO
EDF ERD – France
bruno.nitrosso@edf.fr

ABSTRACT

In compliance with regulatory policies, ERD has been buying its network losses on electricity market since 2004 July 1st. This article presents this experience on two main points: measuring the losses and buying the energy.

MEASURING ELECTRICITY LOSSES

In the French regulatory model, the measuring of electricity lost in the process of conveying it over distribution networks is part of DNOs (such as ERD) financial and statistical responsibility.
Electricity loss is defined as the gap between the amounts entering the network and the amounts actually sold to the end consumer. Losses derive from two sources :

- Technical losses are physically and directly consumed by the network itself (cables, transformers, meters etc…),
- Non-technical losses are consumed by customers and never get paid for, for instance because of database errors, faulty metering or frauds.

In the French regulation model, the Distribution company has to provide for the losses over its network and recoup costs through tariff as an incentive for continued improvement of its network design and metering policy.

On the other hand, European directive mandated that such energy procurement had to be done according to competitive market-based processes starting from July 2004. In order to do so, an hourly measure of losses is required.

Computing difference between electricity entering the network and electricity seen as consumed by customers is not straightforward: index metering reports energy covering periods that does not match any accounting period. Second difficulty is the delay necessary for meter data availability, not compliant with accounting deadlines. As a consequence, customer consumption rests on meter reading for energy and profiling for load curve modelling, taking into account weather, seasonal effect, etc… Inaccurate modelling leads to energy drifts from one accounting period to another.

A multi-step process was thus developed as follows.

Step 1:

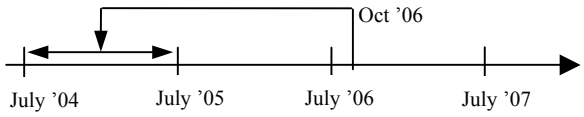
Losses load curve modelling was created as a second order regression binding losses estimated load curve and substations upstream distribution network load curve. In 2004, the regression was calibrated using statistical data covering 2002 and 2003.

$$L(t) = a \times P^2_{substations}(t) + b \times P_{substations}(t) + c$$
$$L(t) = L_{Technical}(t) + L_{Non\ Technical}(t)$$

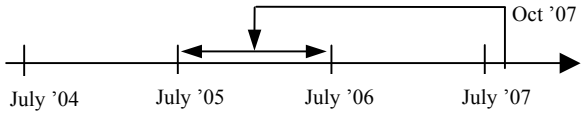
Coefficients (a, b, c) are released on ERD internet website and modelling design was presented at CIRED 2005. Starting 2004 July 1st, losses load curve modelling has become the reference accepted as part of balance responsible rules. As a consequence, it is used for long-term and short-term ERD losses purchase.

Step 2:
Electricity balance responsible system adjusts losses energy every year. Computation agenda is as follow:

October 2006 to adjust July 2004 – June 2005:



October 2007 to adjust July 2005 – June 2006:



The late calculation ensures extensive meter reading availability. Balance responsible system assigns a profiled load curve to every customer consumption in a transparent, fair and accurate way. Load curves are all stacked to compute energy flowing in and out the network during one year. In October 2006, energy lost on each distribution network was computed to cover July 2004 – June 2005.

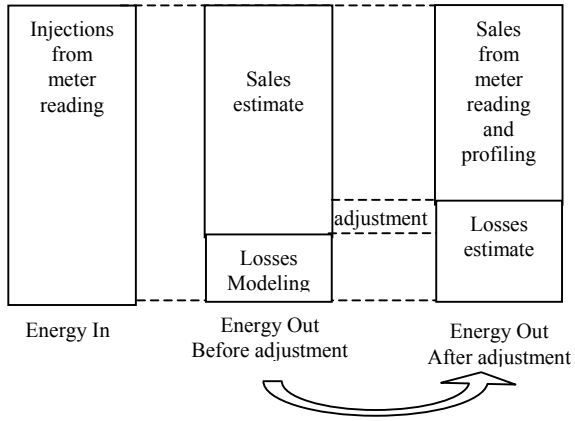
Step 3:
Losses energy computation previously described has financial effects:

- Sales from suppliers and losses from distribution operators are together updated to regularize the past period. Losses energy adjustment preserves its shape from its original load curve modelling. It is priced using Powernext day-ahead rating history.

- ERDs sales (billed and to come/in-meter) are updated to balance the adjustment done on losses over the past period. As a result, energetic balance presented as a support for accounting is preserved.

Stacking together losses (---) and sales (+++) adjustment has potentially great effects on ERD financial reports. For this reason, these impacts are carefully analysed and forecasted by ERD.

Energy balance before and after adjustment:

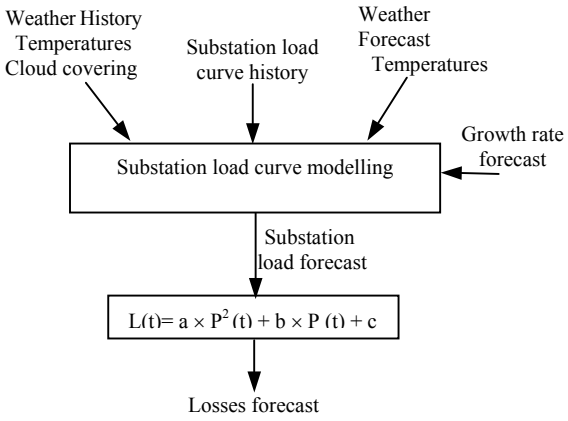


Step 4:
Loss modelling regression is updated: starting 2007 January 1st, regression is calibrated with updated energy covering July 2004 - June 2005 period. This last step provides modelling feedback. To avoid wave effects, modelling feedback may be operated in the future using 2 or 3 years history instead of just 1 year.

BUYING ELECTRICITY LOSSES

ERD's electricity losses are purchased running losses modelling as a reference. In open electricity markets environment, forecasting knowledge and buying strategy is needed.

Forecasting the losses
Load curve from substations located upstream of the distribution network is used as loss modelling input. This makes losses forecasting very similar to any global consumption forecasting.



Substation load curve forecasting software run by ERD is very similar to those used by Transmission System Operator when matching generation and power needs.

Medium term (3 years) stochastic forecast is generated once a year for evaluating and planning the hedging strategy and associated budgets. It uses near to 500 synthetic temperature scenarios, which allow buying strategy to rely on statistical knowledge for electricity needs. As a last step, deterministic short-term forecast is released every day using 5-days ahead weather forecast. Imbalances are then carefully analysed for modelling feedback.

A buying strategy

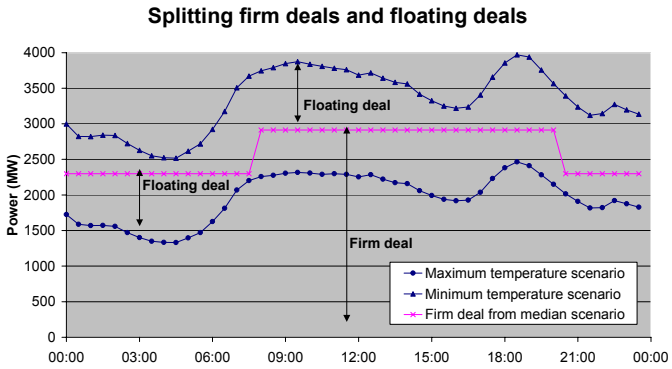
ERD's electricity losses average 18 TW.h every year, which probably represents the biggest single European electricity net purchase.

Market and volume (mainly through weather) volatilities, together with the very large amount of energy itself, entail a high financial risk for the entity's EBITDA which then calls for a strong and clear buying strategy and risk control policy.

The bulk of the energy is bought several years/month ahead in the form of standard Peak/Off-peak take or pay contracts. These contracts have firm prices.

Flexible hourly contracts enable the entity to perfectly match the short term forecast. These adjustments have a floating price indexed to the spot market.

Firm price deals are set up to cover median needs, floating deals cover adjustment between median needs and full range needs. Example below stands for a representative day during winter:



By having set the firm price deals up to the median scenario, short-term adjustments are as often short (more cost) than long (less cost) which greatly mitigates the price risk or spot exposure.

A somehow similar approach has been taken recently for the firm price standard blocks of energy in order to mitigate the price risk.

French wholesale market only quotes quarterly products one year ahead and monthly products three months ahead. As a result, only calendar products can be bought well in advance: three years ahead.

Since the losses load curve is highly seasonal and represents such a volume, buying as the products are quoted means having a chronically short position exposed to market price increases. To mitigate this, ERD buys the annual energy (18 TW.h) in calendar products in a first sweep and then progressively adjusts its positions to match the need as the products are quoted.

Buying such amounts of energy also rises liquidity issues. ERD splits its needs into thousands of standard blocks bought in dozens of Requests For Quotes.

CONCLUSION

ERD's electricity losses cost around 1 billion euros every year recouped through regulated tariff mechanism.
The volumes of electricity and money involved are such that they rise issues of availability, liquidity and financial risks. These are of paramount importance and require a set of competencies that were not to be found previously within the Distribution core competencies.

All the mechanisms and procedures devised and deployed for the July 2004 opening (deregulations for all but residential end users) have been done with July 2007 (full deregulation) in mind : no further methodological modifications are required but the continued improvement process goes on.

REFERENCES

[1] A. DIOP, D. DERCLE (EDF – R&D), "Losses modelling for distribution networks", *CIRED 2005, session 5*

[2] P. LOEVENBRUCK, P.RABUT, G.STAWINSKI (EDF – R&D), "Profiling customers within the framework of the 1 July 2004 market deregulation: description and performance of the system", *CIRED 2005, session 6*