Technical and economic study on smart metering system for the gas retail market in France and evaluation of the experiments carried out by GrDF

Summary of the results of stage 1 of the study

29 July 2010

1 Summary of the context and aims of the study

In its deliberation of 3 September 2009, the French Energy Regulation Commission (CRE) defined the main guidelines to be adopted regarding smart metering on the natural gas retail market in France.

Following this deliberation, CRE commissioned the firms POYRY and SOPRA to perform a technical and economic analysis of the project proposed by GrDF in order to prepare a potential roll out decision on smart metering system for gas in France.

Two main reasons have led to revisit the study carried out by GrDF in 2008:

- This earlier study did not adopt an exhaustive approach in the analysis of the effects of smart metering; in fact, it did not quantify the effect of a smart metering system on energy consumption management;
- Furthermore, since technologies continued to evolve since the study was published, it was deemed necessary to review the potential technical solutions available and their cost.

The aims of the study carried out by POYRY and SOPRA were to make a thorough investigation on the three following points:

- Reliability of infrastructure costs based on the functions implemented, and on the technical options;
- Reliability of savings associated with optimising the gas system for all parties in the value chain;
- Order of magnitude of the savings associated with energy management services based on the functions implemented.

This study is split in 2 main phases:

- Phase 1: technical and economic study designed to confirm and enrich the assumptions adopted as part of the study carried out by GrDF in 2008 and to re-assess the business case;
- Phase 2: feedback and evaluation of the experiments carried out by GrDF in order to fine-tune recommendations of Phase 1.

This note summarises the results of the technical and economic analysis of Phase 1 carried out by POYRY and SOPRA during the first half of 2010, following consultation with GrDF and several interested parties such as equipment manufacturers, suppliers, a consumer association, the FNCCR and the National Energy Mediator.

This study was carried out considering the hypothesis of a general roll-out of a smart metering system for electricity (Linky Project managed by ERDF).

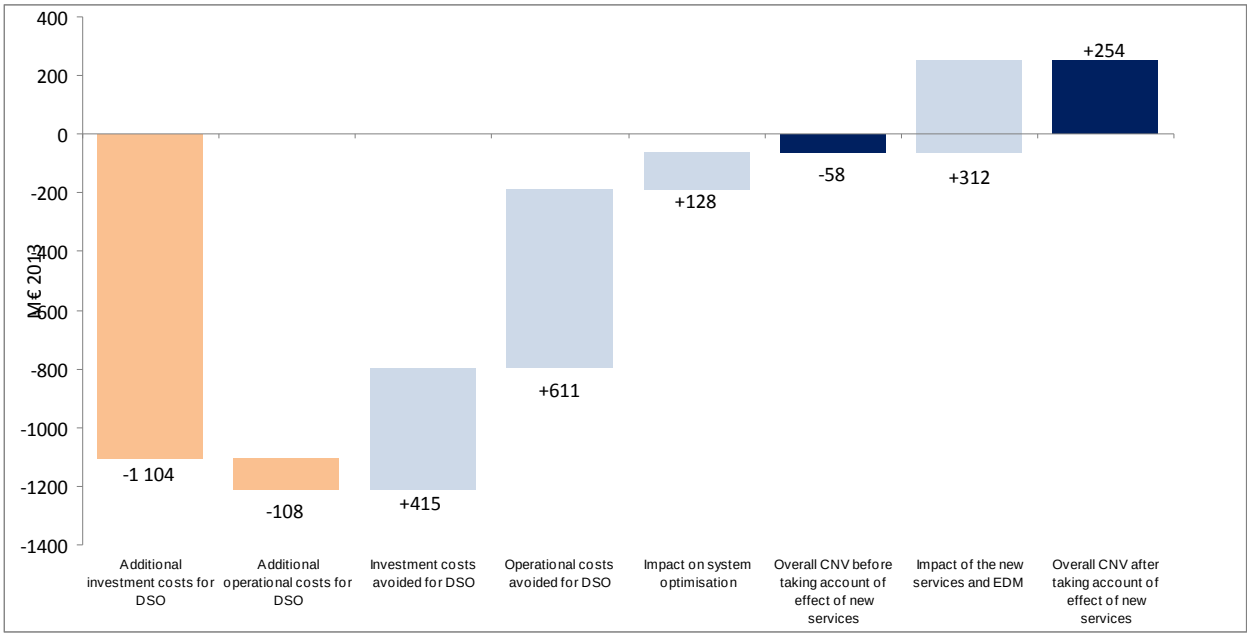
2 Results of the analysis

The economic value of smart gas metering is estimated at approximately +€250 m[1], based on an analysis carried out over a period of 20 years.

This amount is broken down into savings and cost headings as shown below:

[1] Net Present Value (NPV) in euros 2013

Figure 1 : breakdown of the economic value of smart gas metering system



The study revealed four major findings:

- the technical choices available are more numerous than originally imagined, and they will need to be further detailed within the following steps of the study (particularly as a result of the evaluation of the experiments carried out by GrDF);
- the value of the project is very close to economic balance before any savings related to energy efficiency are taken into account;
- the reduction in gas consumption produced by the development of new services offered by suppliers to end consumers – which will be made possible by the implementation of such a smart metering system – has a strong positive impact on the business case by making the project's economic value significantly positive;
- the project brings economic opportunities and is fully consistent with European policy.

2.1 The technical solution will need to be further detailed

Market analysis reveals that many technical solutions are currently available on the market. Those numerous technical choices do not allow making a straight decision about what would be the optimal solution. In particular, GrDF should complement the current work by giving its feedback on the pros and cons of a system including a remote disconnection device (electromagnetic valve) and/or an additional open gateway (for instance a physical output interface).

For economic modelling purposes, a reference solution was defined; this solution strictly conforms to the functional requirements as foreseen by CRE at the lowest cost possible, as shown by the table below:

Table 1 : functional scope adopted for the reference scenario for modelling purposes

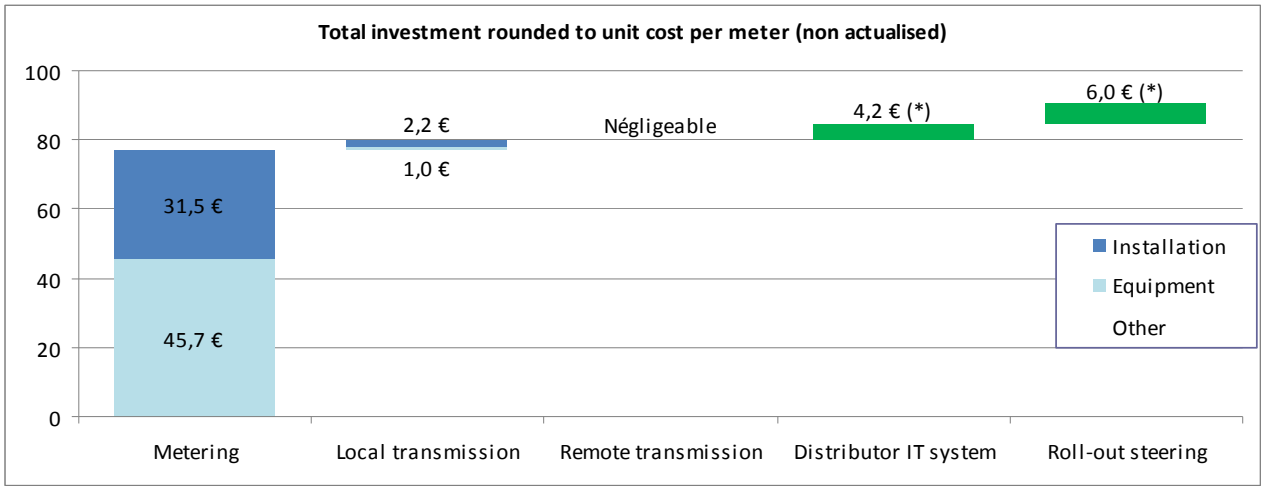
Meters and radio modules	- Meter indexes are sent daily to the DSO, in accordance with the standard proposed by manufacturers and the solution adopted in similar projects (e.g. gas in Italy, water in France). - Basic functionalities required by the CRE are guaranteed by mono-directional communication technology. - No remote steering technology (e.g. electromagnetic valve) is envisaged. - The primary battery is designed to have a lifespan of 20 years and can be changed.
LAN local network	- Communication from meters to concentrators is not based on repeaters in the reference scenario, which reduces investment and operating costs and avoids hosting negotiation fees. - The concentrators adopted are bidirectional, so as to leave open the possibility of enriched functionalities or making the infrastructure available for other uses. The cost is of the same order of magnitude as for a mono-directional concentrator.
WAN remote network	- Data transmission via existing infrastructures.
IT systems	- The IT system will be adapted to transmit the real indexes on a monthly basis, and the indexes on the dates of contractual event (change of supplier, move-in, move-out) or price changes. - The option of providing all the indexes on the same date has not been adopted: GrDF and suppliers do not wish to handle an activity spike as part of their IT process. - On the other hand, suppliers may choose the dates on which the indexes are transmitted (within a certain time range) without generating any increased IT cost([1]).

(1) view of Sopra / Poyry Consulting

The reference solution is not an official technical stipulation, but it does set a reference value for the purpose of evaluating other solutions.

The associated investment cost is €90 per meter, broken down approximately equally between supplying the equipment and rolling out the system, as the following graph shows:

Figure 2 : breakdown of investment cost par meter



(*) The investment concerning the DSO IT systems and the steering for roll-out were supplied by GrDF and have not been subjected to detailed analysis.

In total, the investment cost would be €1104 m in Net Present Value (NPV), partially offset by the investment avoided by replacing the old meters, estimated at €415 m, representing a net investment cost of around €700 m.

Uncertainties remain as to certain assumptions, however, in particular with regard to the cost of meters, whose impact on the NPV of the project could vary between -€150 m and +€90 m. This risk can be reduced only once the experiments have been performed and a detailed set of specifications has been drawn up.

2.2 The industrial project is close to economic balance

The impact of smart metering on the optimisation of the whole gas system was evaluated for all players involved in the value chain:

- end consumers;
- suppliers in the distribution network and shippers in the transport networks;
- distribution system operators (DSO), transport system operators and storage operators.

In total, the savings associated with optimisation of the gas system in France are valued at €1154 m in net present value. These savings mainly consist in:

- avoiding twice-a-year on-site meter-reading, which costs €506 m (taking particular consideration of the impact of the unbundling of the gas and electricity on-site meter reading services which would be caused by the implementation of the Linky project);
- avoiding the replacement of the old meters, which would cost €415 m; this contributes towards reducing the investment costs for the project.

Taking account of this level of gains, the business case is close to economic balance, with a NPV of -€58 m, excluding savings associated with the new services and the management of energy consumption (cf. Figure 1). It should be noted that this result is subject to the discount rate used. If this rate were set at 4% for all parties involved, the NPV would be +€60 m.

2.3 The project contributes to energy efficiency

International feedback on the energy consumption management which is strictly linked with smart gas metering system is still rather poor:

- few experimental studies and no quantitative results available;
- theoretical studies, including the study carried out in the UK by the Department of Energy and Climate Change, which assumes a saving of 2% in gas consumption.

In the present study, energy consumption savings were estimated using an analytical approach by considering the reduction in consumption due to the change in behaviour induced by the new services that suppliers might implement once the smart gas meters have been rolled out: this approach indicates an energy saving estimated at 0.5% once the entire smart metering system has been rolled out. The base volume of gas affected by the reduction in consumption is estimated at 123 TWh per year.

In total, relying on careful assumptions, the energy consumption savings produced by new services are estimated at over €300 m (in NPV, cf. Figure 1) and could be considerably higher.

Moreover, the additional functionalities contemplated by the CRE deliberation would increase investment costs but would also enable new services to be developed whose impact on the energy consumption management could strongly increase the project's profitability, as shown in Table 2:

Table 2 : impact of additional functionnalities on the Business Case

In Net Present Value, in €m (2013)	Option 1: additional output on meter / open gateway	Option 2: occasional increase in the frequency of meter-reading	Options 1 + 2
Additional investment costs	+€27 m	+€59 m	+€86 m
Impact on overall NPV **before** taking account of the effect of new services and energy consumption management	-€27 M	-€59 M	-€86 M
Impact on overall NPV **after** taking account of the effect of new services and energy consumption management	+€10 M	+€60 M	+€70 M
Savings/investment ratio	37%	102%	81%

2.4 The project is offering economic opportunities and is in line with European policy

Beyond the economic effects quantified in the study, a certain number of opportunities, which were not taken into account when calculating the NPV as they are impossible to quantify, are associated with the smart gas metering project, including:

- increased comfort for the consumer, thanks among others to more accurate billing;
- better functioning of the gas market, particularly thanks to opportunities brought by commercial innovations made possible by new functionalities;
- creation of jobs providing a high added value and opportunity to develop new industrial skills; termination of conventional meter-reading business will however have an impact on employment;
- need to be proactive with regard to the European commission orientations and the recommendations of the European Regulators' Group for Electricity and Gas (ERGEG).

3 Recommendations

The project to roll out a smart gas metering system is likely to add value as far as the entire gas industry is considered. The preparatory work should thus be continued with a view to prepare the roll-out decision process.

The next stages should concentrate on laying down the functional specifications and setting a budget aim and a regulatory framework that will enable the value of the project to be maximised. Four main recommendations should act as guiding principles for the next stages.

Ensure that actual consumption data is available (public authorities)

Systematically informing consumers at no extra charge of their actual gas consumption, at least once a month, must be guaranteed by public authorities. In particular, it should be determined whether it is the DSO or the suppliers who will be responsible for this.

Define a precise budget framework

The amount of investments must be defined so as to be consistent with the benefits that the project could bring to all parties in the gas value chain:

- set the maximum budget for the project and secure a budget to cover unforeseen events (in the region of 5-10%); (decision to be taken by public authorities and CRE following a proposal from GrDF);
- define a list of the main functionalities desired (decision to be taken by public authorities and CRE following a proposal from GrDF);
- reference the manufacturers that undertake to meet expectations whilst adhering to a price ceiling (GrDF);
- define the regulatory mechanisms to act as incentives for the various parties involved to minimise costs of the project (public authorities, CRE).

Stipulate the savings linked with managing energy consumption (CRE, GrDF)

The assumptions on energy consumption management related savings must be clarified as a result of the studies currently being carried out in the UK by the British regulator Ofgem and the experiments to be performed by GrDF.

Analyse in-depth AMR[2] functionalities (GrDF, suppliers)

Since the savings expected from the implementation of additional functionalities are linked solely to the provision of new services, they should be analysed more precisely with suppliers. In particular, work should be done with GrDF to identify the current users of the output interface (open gateway) and to determine together with them the use that is made of it.

Analyse in-depth functionalities beyond AMR (GrDF, suppliers)

In France, it should be examined to what extent the current practices of GrDF in terms of gas installation safety can be adapted to enable these functionalities to be rolled out (a system incorporating a remote disconnection unit – electromagnetic valve – and/or a second output interface / open gateway).

[2] AMR (Automated Meter Reading): the smart metering system recommended in the deliberation of the CRE of 3 September 2009