

# marcogaz

TECHNICAL ASSOCIATION  
OF THE EUROPEAN NATURAL GAS INDUSTRY



## Gas Smart Metering System

## MARCOGAZ and FACOGAZ position

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- **Marcogaz**

- Technical Association of the European Natural Gas Industry
- Members are representing more than 100 million installed domestic gas meter in Europe owned by Distribution System Operators and Meters Operators
- [www.marcogaz.be](http://www.marcogaz.be)

- **Facogaz**

- Association of European Gas Meter Manufacturers
- Members are representing more than 90% of the gas meters manufactured in Europe

- A policy concerning energy is under development in Europe
  - Energy Services Directive (2006/32/EC)
  - 3<sup>rd</sup> Gas Directive (2009)
  - Energy Performance of Building Directive
  - Renewable Energy Policy
  - Standardisation Mandate M/441
  - ...
- The main objectives of interest to gas industry and consumers are:
  - **Energy efficiency and hence the consequential reduction of CO<sub>2</sub>**
  - **Competition for energy commercialization**
  - **Distribution cost control**
  - **Consumer protection and pricing transparency**
  - **Improvements in customer service**

- To support these policies, stakeholders are considering the development of new procedures and tools  
One of these is the concept of a **“Smart Meter”**
  - Notwithstanding that
    - some of the drivers are different for the electricity and gas markets;
    - the cost benefit analysis is different for the gas and electric system,
- the gas industry would like to benefit from the **interoperability** and the developments already undertaken to realize the opportunities that gas smart metering systems could offer.



- **Gas networks store huge amounts of energy** and therefore react slowly over time to changes in demand, HOWEVER electricity networks require real-time responses to changes in demand as electricity cannot be stored.
- The type of **gas appliances** are limited to mainly cooking, heating and hot water, which **provide for fundamental human needs**, WHEREAS the multiplicity of electrical appliances could lead to complex optimization of electricity consumption by customers.
- As most of **gas systems react slowly to changes** in operation, the consumer **may not see instantaneous changes** to the operations of their appliances, WHEREAS the immediate response of electrical appliances would provide instantaneous information that could help the customer to rationalise their electricity consumption.

As gas appliances tend to provide for basic needs (minimum ambient temperature, minimum water temperature and hot food), there is limited scope to reduce energy consumption because any **reduction depends on the installed appliance's efficiency and the level of insulation in the home**

There are many factors where the consumer has **no short term influence** (external environment such as a long cold winter, damp atmosphere...)

**THEREFORE**

**Opportunities and benefits for smart metering systems are different for gas and electricity**

- There is **no generally common accepted definition** for a smart meter, but in terms of guiding principles, any smart metering system should be based on :
  - **Helping the end user to manage its gas consumption by providing better quality information**
  - **Facilitating the end users to switch energy suppliers**
  - **Offering the right balance between cost and additional functionalities**

MARCOGAZ and FACOGAZ believe that there are three main areas of possible additional functions to the gas meter:

- Remote index reading to allows more frequent index reading
- Delivery and receiving of information, to facilitate the customer to reduce their energy consumption and manage their energy cost
- Consumer supply management (switching, prepayment, shut-off valve...)

Additional functions are allowed by the MID but they **shall not influence the metrological characteristics** of the measuring instrument



- Temperature compensation is covered by MI-002 of the MID and therefore is not an additional function
- For residential use, the consumption is **measured** in **volume**, but the **bill** is given in **energy units**, taking into account the volume measured by the gas meter, the gas temperature, gas pressure and the gas composition/calorific value of the gas

**The energy suppliers are looking for a system which:**

- Could help them differentiate their service from the services of other suppliers
- Is easy to customize
- Gives reliable results
- Gives accessible information to the customer
- Will allow the parameters to be easily changed, e.g. prepayment to credit switching, manage debt more effectively, etc.
- Will have no major adverse impact on distribution/metering charges

## The end users are interested in:

- Accurate billing
- Low prices
- Ease of supplier switching
- Minimum visits to their premises
- Systems that help them with their energy consumption management
- Systems which are easy to use
- Additional services that could be offered

**The network/meter operators are looking for**

a standard and durable solution which should last at least 15 to 20 years with minimum maintenance and where the investment is guaranteed for the long term



- The traditional technology for residential gas meters
  - Has been available for a long time (>150 years)
  - Is based on the measurement of the volume passing through the meter
  - Is purely mechanical and does not need any external power source to function
  - **The lifetime of these meters are 20 years or more and they do not require any maintenance**
- Some of the recent meters are fitted with a contact that can be used for transmitting an electrical pulse output which is proportional to the volume of gas.

In order to use these pulses, additional electrical powered equipment is required which has to respect the **electrical safety requirements**

- In a few Countries with extreme weather conditions, some meters are equipped with a mechanical temperature conversion device. In other Countries, additional functionality devices are installed to residential meters for specific needs e.g.:
  - prepayment, earthquake safety devices including shut-off valve
    - Residential meters incorporating shut-off systems are not yet standardized on a European level (**safety**, functionality, design of valve, communication architecture...)
- Previous field trials using gas meters with new functionalities have provided the industry with a valuable insight into the needs of the customers and industry
- To facilitate the addition of functionalities and trying to improve the metrological characteristics, new meter designs using an electronic platform were developed such as:
  - **Ultrasonic meters**
  - **Fluidic meters**
  - **Thermal mass meters**

- The issue has always been about:
  - The reliability
  - The cost benefits of the system

Since these initial trials and the current climate to increase energy efficiency, the cost benefits analysis and the reliability for a smart metering system need to be revisited

At the moment it is not clear,  
on European level,  
what a gas smart metering system should offer and  
what price is acceptable to the market

Depending on the functionalities required, some important  
**technical, safety, communication and metrological issues** will  
have to be solved



- With the exception of the few residential static gas meters installed, the gas meters do not have an electrical power supply which is necessary for additional functionalities
- If electricity is used by the gas smart metering system, special care has to be given to the **electrical safety** as described in the relevant directives and European standards
- Battery power seems to be the most suitable solution since most of the gas meters are not installed near the electricity meter
- The lifetime of the battery depends on the environmental conditions, flow rate, number of operations of external communications devices and on the energy needed by the additional functionalities

- Whereas electricity meters measure the consumption in energy (kWh), with the result is given instantaneously, gas meters are indicating the gas volume passing through it at measuring condition ( $m^3$ ). Currently there is no residential gas meter available on the market giving the results in energy

There are technical obstacles to the development of such energy meters:

- Temperature and pressure compensation
- Calorific value
  - Currently determined at the network level with very accurate but expensive equipment
  - Use of such equipment at each residential metering point **is not currently feasible for economic and safety reasons**

- The physics and metrological requirements do not allow **instantaneous** determination of the gas energy at the point of delivery. This is due to:
  - Small variation in gas quality
  - CV measuring stations being remote of the point of delivery
  - Time taken for the gas molecules to reach the end user which varies on the flow at the particular point of time
- It should be noted that the uncertainty on the determination of energy (taking into account CV) at the point of delivery, decreases as the **time period** of determination increases
- Although precise energy determination at the meter may not be feasible, energy consumption information, may be provided to the end user by other means such as:
  - Indicative energy consumption displayed using CV sent on a periodic basis from the back-office
  - Providing the end user with access to the energy calculation done in the back-office

- Some of the recent residential meters are fitted with a contact that can be used for transmitting an electrical pulse output which is proportional to the volume of gas passed through the meter. In order to use these pulses, additional electrical powered equipment is required
- The pulse output of a residential gas meter is already harmonized in Europe, the output connector of the meter is not
- A lot of meters installed in the network will have to be changed
- Consideration shall be given to the **electrical safety** and the fact that a lot of residential gas meters are installed **outside**



- One technical feasible system to help the end user managing their gas consumption is to provide an output from the gas meter which represents the measured gas volume
  - This output can be used by a 'home display unit'
  - Preferably common for gas, electricity, water, heat... consumption
  - Can calculate and display the necessary data to manage the home consumption, for instance
    - Load profiles
    - Comparisons of consumptions...
    - Could even provide adaptive control to manage the energy consumption (e.g. to bring the heating on at the correct time or switch it off when no one is home)
  - It is easily feasible to provide this 'home display unit' with a communication system (e.g. by internet) to provide the end user with more useful information

Providing a safe electrical power supply associated with electronics and internal memory/data logging is available, adding:

- One way secured communication system allows **remote reading of the meter index and associated meter data**
  - It facilitates to deliver more information, avoids estimated bills and could smooth supplier switching process
- Two way secured communication system allows integrating a clock/calendar metrological adjusted by remote control in the gas smart metering system which opens the door to **multiple tariffs, to time based load profiles**
- Two way secured communication system and a valve, allows **remote shut-off and prepayment facilities**
  - For security reasons the valve may not be opened remotely without a safety feature
- A computer and a two way secured communication system allows transmitting **commercial data** between suppliers and end user

- Remote index reading
- Customer information (energy consumption, tariff, prices,...)
- Display in the household
- Flexible tariffs
- Load profile
- Prepayment
- Remote control (shut-off...)
- Fraud prevention
- Energy determination
- Temperature compensation

The table given in the position paper provides a comprehensive but not exhaustive list of additional functions taking into account the advantages and disadvantages for the stakeholders

- Once a **safe** electrical power supply, electronics, software, secured communication system that respects the **metrological** requirements is available, the price to pay for the system is dependent on the functionalities required
- The cost of replacing current gas meters with more expensive gas smart metering systems and of providing the necessary communications infrastructure has to be carefully assessed
- For smart metering to be adopted there has got to be benefits for the **end user** who directly or indirectly will pay the costs, and these benefits need to be appropriately valued to ensure a cost effective solution is provided. These costs for installation, maintenance and metrological verification of a gas smart metering system need to be balanced against the additional benefits



- The introduction and development of gas smart metering is an area where the Members of Marcogaz and Facogaz are the experts that should be central to any consultation concerning possible additional functionalities to the gas meters
- The EC mandate M/441 for the standardization for gas smart metering system provides an opportunity to develop innovative products based on common European standards
- Additional functions under national law shall not prevent a barrier to trade by restricting the free movement of goods or technical innovation
- Although the drivers and solutions could be different, we promote any industry synergies between all utility systems. Interoperability and ease of operation are essential. Interoperability should be sought but there is a risk of complexity
- Any gas smart metering system has to respect the specific gas safety issues
- If we do not get this right, then the customer experience will be poor and could be detrimental to the introduction of smart metering