

CEER Benchmarking Report on Meter Data Management Case Studies

**Ref: C12-RMF-46-05
7 November 2012**

INFORMATION PAGE

Abstract

This document (C12-RMF-46-05) presents case studies on Meter Data Management.

Demand response creates a need to communicate vast volumes of metering data to an increasing number of stakeholders. The aim of this report is to provide an overview of case studies and projects on national contact points in order to obtain information on how metering data is managed. The report draws on national databases and/or hubs and any other projects related to the management and transmission of electricity and gas metering data.

In April 2012, CEER held a workshop on Meter Data Management¹, with case studies provided by different NRAs and stakeholders. The case studies presented during the workshop served as background to elaborate this Benchmarking Report.

Target Audience

European Commission, energy suppliers, traders, gas/electricity customers, gas/electricity industry, consumer representative groups, network operators, Member States, academics and other interested parties.

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¹ Workshop documentation available at:
http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_WORKSHOP/CEER-ERGEG%20EVENTS/CUSTOMERS/WS_meter_data_management

Related Documents

CEER documents

- Guidelines of Good Practice on Electricity and Gas Retail Market Design, with a Focus on Switching and Billing, CEER, January 2012, Ref. C11-RMF-39-03, http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPER_S/Customers/Tab3/C11-RMF-39-03_GGP-Retail-Market-Design_24-Jan-2012.pdf
- CEER 2012 Work Programme, CEER, January 2012, Ref. C11-WPDC-22-06, http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/Work_Programmes/2012/C11-WPDC-22-06_public%20WP2012_24-January-2012.pdf
- CEER Advice on the Take-off of a Demand Response Electricity Market with Smart Meters, CEER, December 2011, Ref. C11-RMF-36-03, http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPER_S/Customers/Tab2/C11-RMF-36-03_DemandResponse-with-SM_1-Dec-2011.pdf
- Guidelines of Good Practice on Regulatory Aspects of Smart Metering for Electricity and Gas, ERGEG, February 2011, Ref. E10-RMF-29-05, http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPER_S/Customers/Tab2/E10-RMF-29-05_GGP_SM_8-Feb-2011.pdf
- ERGEG Position Paper on Smart Grids. An ERGEG Conclusions Paper, ERGEG, June 2010, Ref. E10-EQS-38-05, http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPER_S/Electricity/2010/E10-EQS-38-05_SmartGrids_Conclusions_10-Jun-2010_Corrigendum.pdf
- ERGEG Status Review on Regulatory Aspects of Smart Metering (Electricity and Gas) as of May 2009, ERGEG, October 2009, Ref. E09-RMF-17-03, http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPER_S/Customers/Tab/E09-RMF-17-03_SmartMetering-SR_19-Oct-09.pdf

External documents

- Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC, <http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:211:0055:0093:EN:PDF>
- Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC, <http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:211:0094:0136:EN:PDF>
- Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, <http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF>
- Mandate M/441: DG ENTERPRISE initiative, Standardisation mandate to CEN, CENELEC and ETSI in the field of measuring instruments for the development of an open architecture for utility meters involving communication protocols enabling interoperability, 12 March 2009, <http://www.cen.eu/cen/Sectors/Sectors/Measurement/Documents/M441.pdf>

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EXECUTIVE SUMMARY

Due to the ongoing and future technological improvements and as a result of the foreseen full deployment of smart grids and smart meters – depending on the results of the economical assessment – the meter data management (MDM) model(s) and consequent regulatory developments become fundamental. The Council of European Energy Regulators (CEER) does not consider smart grids and smart meters to be goals in themselves, but rather tools to fulfil the provisions of the 3rd Internal Energy Market Package – achieving a well-functioning and competitive energy market – and to help reach the EU energy and climate targets for the year 2020.

Within the framework of the 3rd Package, policy and regulatory measures are being developed for the deployment of smart meters. The European Commission recently adopted a Communication on ‘Smart Grids: from innovation to deployment’ (April 2011) and developed ‘Recommendations on preparations for the roll-out of smart metering systems’² (March 2012).

The European Commission’s Smart Grids Task Force has an Expert Group, EG 3, devoted to looking at the possible development of retail market models within the scope of a smart grid environment³.

The use of smart meters and demand response create a need to communicate large volumes of metering data to an increasing number of stakeholders. Customers will have to be able to access the information they need to understand and manage their energy use in order to save money on bills and to reduce carbon emissions. Smart metering energy consumption data will also enable the industry to operate more efficiently. These changes are not without challenges for consumers, and Member States as well as regulators need to ensure that the appropriate protection and support are in place.

This Benchmarking Report provides an overview of meter data management in nine countries: Austria, Belgium, Denmark, Germany, Italy, Norway, Spain, the Netherlands and the United Kingdom.

In most countries the responsibility for metering activities (installation, maintenance, meter reading, data management, etc.) lies solely with the Distribution System Operator (DSO). In two countries (the United Kingdom and Germany), other companies, such as a metering company or/and a supplier and/or a DSO, may also be responsible for metering operations.

The present report illustrates the diversity of approaches to meter data management. There is a variety of different ways to handle with meter data management. The most common

² 2012/148/EU: Commission Recommendation of 9 March 2012 on preparations for the roll-out of smart metering systems.

³ The mission of the Smart Grids Task Force (SGTF) is to advise the European Commission on policy and regulatory frameworks at European level to co-ordinate the first steps towards the implementation of Smart Grids under the provision of the Third Energy Package and to assist the Commission in identifying projects of common interest in the field of Smart Grids under the context of regulations on guidelines for Trans-European Infrastructure (COM (2011)658 and 657).

approach seems to have centralised access and decentralised storage. This is true in five of the cases; Austria, Belgium, Spain (for gas), the Netherlands and the United Kingdom.

Two of the cases have a strictly centralised approach with centralised access and storage; Denmark (for electricity only, not for gas) and Norway. Italy is moving from a decentralised approach to a strict centralised approach and will join Denmark and Norway in this category.

There is one case where there is a strict decentralised approach, Germany. This is particularly interesting considering the vast number of stakeholders in the German market – about 2,000 stakeholders in electricity market and over 1,500 in the gas market.

Meter data management (MDM) is also an area where many regulatory changes are occurring. In five of the nine case studies new regulation is in place for a new MDM model; Austria, Denmark, Italy, Norway and the United Kingdom.

Many of the participating countries made choices on the MDM model as a result of smart metering roll-outs. The rationale for centralised MDM seems to be strengthened in a smart metering environment because of the increased amount of information exchanged.

The report found that the most important factors for supporting and choosing a particular MDM model are cost efficiency, transparency, data security and efficient processes. Other areas where the countries covered in this report see advantages of the chosen model are greater ability to facilitate the development of smart grid services, governance and proportionality.

There is a clear understanding in all participating countries that the chosen MDM model needs clear rules regarding data access, privacy and security in view of protecting consumers' interests while enabling proportionate access to data by authorised parties to ensure that benefits can be delivered.

CEER notes that there are differences in market design and conditions across European markets, such as the number of actors, or the roles of stakeholders involved and thus different MDM models are in place.

CEER considers that efficient and secure information and data access for relevant stakeholders is fundamental for a proper retail market functioning and customer protection and empowerment. At this stage, CEER does not intend to suggest a specific MDM model, whilst bearing in mind that regulation should be output-based and technology-neutral.

Next steps

This Benchmarking Report shows that CEER members are undertaking substantial work in relation to meter data management and in particular regarding issues of access to data, privacy and security.

Some work still remains to be done in order to ensure that smart metering benefits consumers as intended. CEER therefore plans to continue its work on smart metering issues and in 2013, CEER will develop Advice on retail market data management for better retail market functioning.

1. Introduction

Meter data management

Meter data management (MDM) concerns the collection and use of vast quantities of data, more generally called the treatment of data, delivered by energy consumption metering systems. The MDM approach is central to market functioning and is the subject of much debate, in particular as regards regulatory, functional and technical aspects. As smart meters are rolled out with additional functionalities and offering more data more frequently, the question of meter data management will become all the more important.

CEER therefore decided to provide an overview of a number of national MDM configurations. This report describes case studies or projects of national points of contact for information on metering data. It includes national databases and/or hubs and any other projects related to the management and communication of metering data.

Stakeholders and customers need to have access to and sometimes share and communicate information efficiently to carry out high-quality retail market processes such as switching and billing. This is also necessary for the development of energy services to customers.

Meter data management can be done in different ways and is a corner stone to a well-functioning energy market. In many countries a point-to-point, or “decentralised” approach, is in place, which in many cases means that the DSO is the database and hub for metering data and is, as such, a market facilitator for other stakeholders. In other countries a different approach was chosen whereby MDM is the responsibility of a single actor who manages the storage and/or manages some processes in the energy market, and/or enables access to data through a central point of communication. These examples would constitute a “centralised” approach.

The latter MDM model indicates that at least some part of the MDM is centralised. This could be reporting of data to a central point, the storage of data, validation of data, communication of data, processes carried out centrally etc. The level of centralisation can vary between the models. Decentralised models indicate that MDM is carried out bilaterally to a large extent. In these models the DSO tends to be the database and the hub.

Access to data and customer data privacy and security

When it comes to discussions about smart metering, data privacy and access to data are important issues from the customer’s point of view. Smart meters offer the possibility to collect much more granular data than before. The Article 29 Working Party⁴ has stated that *“the operation of smart meters – and by extension any further developments of smart grids*

⁴ The Article 29 Data Protection Working Party was set up under Directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free movement of such data. For Opinion 12/2011 on smart metering, see:

http://ec.europa.eu/justice/policies/privacy/docs/wpdocs/2011/wp183_en.pdf

and appliances – entail the processing of personal data as defined by Article 2 of Directive 95/46/EC”.

Access to data is however essential to ensure the smooth functioning of the retail market. By way of example, data are needed for a smooth switch of suppliers; for billing and provision of energy services; for suppliers to make reliable product offers to customers; and for management of the grid. Therefore, it is essential that stakeholders have access to relevant data.

CEER considers that one way ensure customer trust in smart metering systems is to ensure that customers always control/have the right to control the data and that they know what data is available and to whom.

Regulators’ previous work

Over the last couple of years, European Energy Regulators have covered smart meters and smart grids issues in several published documents. The “*CEER Guidelines of Good Practice on Electricity and Gas Retail Market Design, with a Focus on Supplier Switching and Billing*” provide recommendations on the roles and responsibilities of market actors in the electricity and gas retail markets. The “*CEER Advice on the Take-off of a Demand Response Electricity Market with Smart Meters*”, lists the prerequisites necessary to implement demand response and describes the roles and responsibilities for different market actors to use demand response in a smart metering environment. The “*ERGEG Guidelines of Good Practice on Regulatory Aspects of Smart Metering for Electricity and Gas*”, developed recommendations for services (to customers and micro-generators) which should be developed in a smart metering environment. The “*Position Paper on Smart Grids – An ERGEG Conclusions Paper*” sets out recommendations for the development of smart grids.

Objectives

This report seeks to provide an overview of practices and MDM models currently in place in different countries rather than recommendation on best practices. It presents case studies from the following Member States:

- Austria;
- Belgium;
- Denmark;
- Germany;
- Italy;
- Norway;
- Spain;
- the Netherlands; and
- the United Kingdom⁵.

⁵The approach described in this document relates to Great Britain (England, Scotland and Wales). Northern Ireland has a separate arrangements established by its own regulator, the Northern Ireland Authority for Utility Regulation.

CEER strongly supports the harmonisation of the European energy market. However, due to the fact that market design and conditions might differ across Europe, CEER believes that different countries might require different meter data management models but also that the elaboration of a converging market model⁶ should nevertheless be sufficiently broad or high-level in character to take into consideration the specificities of different countries⁷.

CEER considers that the elaboration and implementation of possible MDM models in different countries require a step-by-step approach and therefore an adequate time-frame.

The Electricity Directive 2009/72/EC allows Member States to roll-out intelligent metering systems subject to an economic assessment of all the long term costs and benefits to the market and the individual consumer. This assessment might also include elaborating meter data management models and should have taken place by September 2012.

Methodology

Preparation of this Benchmarking Report was supported by input received from stakeholders and discussions held during a CEER workshop on Meter Data Management on 19 April 2012 in Brussels. At this workshop, more than 80 representatives from NRAs, industry, customer associations and the academic community discussed several aspects of MDM.

The main issues raised were:

- the importance of MDM for customers;
- privacy and security;
- case studies of a centralised solution; and
- case studies of a decentralised solution.

At this workshop CEER collected preliminary input which fed into and further developed in the present report.

Nine CEER members provided case studies for this report. They were completed based on a template provided by CEER which included the following components for each case study:

- an overview of energy markets (including retail and networks segments) and regulation;
- discussion on the data management model (i.e. how meter data is managed and shared with relevant parties) and roles of key stakeholders; customers, including the rules around privacy, consumer consent, information provided to consumers and the potential costs and benefits to consumers; and
- the rationale for adopting a centralised or decentralised communications model including the advantages and disadvantages of the chosen model.

In this report, each country is covered under a separate subheading from 2.1 to 2.9. Chapter three summarises the findings and provides conclusions.

⁷ See the conclusions of the 4th Citizens' Energy Forum 26 -27 October 2011.

⁷ Market model design, i.e. number of involved actors, roles of stakeholders involved, etc.

2. Case studies

2.1. Austria

2.1.1. Market overview

When the Austrian energy market was fully liberalised in 2001 (electricity market) and in 2002 (natural gas market), a number of great technical and organisational changes resulted for the Austrian market participants.

Basic principles

Electricity market

Nowadays, the Austrian market model for the liberalised electricity market builds on the following basic principles:

1. Operation of the (transmission and distribution) grids is separate from competitive activities, such as generation and supply (wholesale and retail).
2. Responsibility for secure grid operation, for metering and for handling and processing grid user data generally lies with the distribution system operators (DSOs).
3. Transmission system operators (TSOs), apart from operating the transmission grids, also act as control area managers (CAM). In this role, they must ensure that injection and withdrawal of electricity are balanced at all times.
4. So-called “balance groups” were introduced to enable all grid users (consumers, generators, suppliers and traders) to trade or conclude deals with each other. Each trader and each withdrawing and injecting party must be member of a balance group.
5. Each grid user (consumer or producer) concludes a system use contract with the grid operator and another contract with the desired supplier or trader.
6. Injections and withdrawals of electricity are forecast and settled according to 15-minute intervals. However, the meters of consumers and producers with connected capacities below 50 kW and of producers that inject less than 100,000 kWh/year are usually only read once per year. In these cases, so-called “standardised load profiles” (SLPs) for different user categories (e.g. households, small businesses, agriculture, and PV generation) are drawn up and used as proxies for the 15-minute meter readings. For all other grid users, generation and consumption are actually metered at 15-minute intervals.

Natural gas market

With the energy market liberalisation, the Austrian gas market was divided into three control areas, each under the management of a control area manager.⁸

Each supplier selling gas to end consumers in the control area has to be a member of a balance group or establish a new balance group. Currently there is an hourly balancing

⁸ This is AGGM for control area east (comprising Burgenland, Styria, Vienna, Lower Austria, Upper Austria, Carinthia and Salzburg), TIWAG for control area Tirol and VKW for control area Vorarlberg.

regime. The balancing energy is called by the control area manager and charged by the balance group coordinator.

Due to the provisions in the 3rd Package, an Entry-Exit system has to be implemented in the transmission system and, as a consequence, a new market model will come into force as of 1 January 2013. This means that there will be a market area (combination of systems of different system operators within which a party entitled to system access can flexibly use its booked capacity at entry and exit points) with a virtual trading point instead of the control area. Central European Gas Hub (CEGH) will be the operator of this virtual trading point. The market areas Tirol and Vorarlberg will be connected to the German market via Net Connect Germany (NCG). In these two market areas the new system will come into force on 1 October 2013. As the system will change completely, there is a need for new market players: Gas Connect Austria will manage the tasks of the market area manager, Austrian Gas Grid Management (AGGM) those of the distribution area manager. The balancing system will also undergo significant change. To mention only one example, the market area's balancing period will be the gas day, system users with load profile meters will be balanced hourly and those with a load profile meter and a contractual maximum capacity of no more than 50,000 kWh per hour per metering point may opt for a daily balancing. An additional precondition is that meter readings must be available to the DSO online.

Regarding the already existing backpack-principle ("Rucksackprinzip"), it should be noted that the capacity in the network up to the virtual trading point is still available for the end consumer in case of a supplier switching.

Electricity market

Regulated monopoly:

- 2 TSOs
- 128 DSOs

Suppliers:

- 155 suppliers
- 144 suppliers for households, 15 of them nationwide active

Total consumption:

- 55TWh and 5.84 million metering points
- households 4.16 million (metering points) and 13.43TWh consumption

Switching rates:

- total switching rate in 2011: 1.5% of metering points
- switching rate in the group of demand metered consumers: 4.8%

Market concentration:

- 3 companies, including their parent and daughter companies account for 62% of household market share by metering points and aggregated share of retail companies selling at least 5% of total electricity consumed by final customers is 91.8% (2010)

Natural gas market

Regulated monopoly:

- 3 TSOs

- 20 DSOs

Suppliers:

- 36 suppliers,
- 24 suppliers for households, 7 of them nationwide active

Total consumption:

- 102TWh and 1.351 million metering points
- households 1.274 million metering points and 20TWh consumption

Switching rates:

- total switching rate in 2011: 1.1% of metering points
- switching rate in the group of demand metered consumers: 6.1 %

Market concentration:

- 3 companies, including their parent and daughter companies account for 79% of household market share by metering points and aggregated share of retail companies selling at least 5% of total electricity consumed by final customers is 69% (2010)

Tasks and roles of the market participants

The opening of the energy markets created a number of new roles in the market as well as changing the rights and duties of existing players. Clearly defining each participant's role and responsibilities is crucial to enable the market players to work together closely and guarantee smooth functioning of the market and secure electricity and gas supply at all times.

Most prominent participants in the Austrian electricity market

Injecting party - A producer or electricity undertaking feeding electric energy into the grid.

Control area manager (CAM) - The entity which is responsible for load-frequency control within a control area; this function may also be carried out by a third company based in another member state of the European Union. This role is usually fulfilled by a transmission system operator (e.g. Austrian Power Grid – APG).

Network operator - The operator of a transmission or distribution grid with a nominal frequency of 50 Hz. The network operator's responsibilities include metering, confidential handling of grid user data, and non-discriminatory transmission of information to all market participants; at the same time, it must ensure that data is only transmitted to the entitled recipients (e.g. EVN Netz GmbH, WienenergieStromnetz, VKW-Netz AG).

Electricity trader - A natural or legal person or a commercial undertaking selling electric energy with a view to profit (e.g. Austrian Power Trading - APT).

Supplier - A natural or legal person or commercial undertaking that provides electric energy to other natural or legal persons (e.g. EVN Energievertrieb, WienenergieVertrieb GmbH & Co KG).

Consumer - An electricity consumer that buys energy for own use.

The following new roles were created in the wake of liberalisation:

Clearing and settlement agent (CSA) - A natural or legal person with an official license to operate a clearing and settlement agency for the purpose of organising and clearing balancing energy services within a control area; in Austria, these are APCS Power Clearing & Settlement and A&B - Ausgleichsenergie & Bilanzgruppen-Management.

Balance responsible party (BRP) - The entity representing a balance group vis-à-vis other market participants and vis-à-vis the clearing and settlement agent.

Balance group members - Suppliers or customers joined into balance groups within which injection and withdrawal of electricity are balanced.

Most prominent participants in the Austrian gas market

In general the market participants in gas are similar to that of electricity. With the new market model coming into force in January 2013, new market participants have to fulfil their tasks:

Market Area Manager (MAM) - The Market Area Manager has the responsibility to coordinate system operation as well as the infrastructure planning.

Distribution Area Manager (DAM) - The distribution area manager shall book capacity to match the forecast capacity needs at the internal interconnection points from the transmission into the distribution network in the market area.

The distribution area managers shall be:

- for the eastern market area
- for the Tyrol market area
- for the Vorarlberg market area

Clearing and settlement agent (CSA) - The operator of a clearing and settlement agency for transactions and price formation for balancing energy pursuant to section 85⁹ in the distribution network

Balance responsible party (BRP) - Natural or legal person or registered partnership that represents the members of a balance group and is responsible vis-à-vis other market participants and the clearing and settlement agent.

Regulatory regime

Full liberalisation of the electricity and natural gas markets which introduced competition not only changed the legislative framework for electricity and gas companies' activities in Austria, but transformed the market oversight arrangements too.

⁹ See section 85 of the Austrian Natural Gas Act 2011,

http://www.e-control.at/portal/page/portal/medienbibliothek/gas/dokumente/pdfs/GWG_en_konsolidiert-v3.pdf

For this purpose, the legislator passed the Energie-Regulierungsbehördengesetz (Energy Regulatory Authorities Act) and set up E-Control, which took up its activities on 1 March 2001. It is entrusted with the task of monitoring, reviewing and, if necessary, regulating the liberalisation of the Austrian electricity and gas markets.

E-Control's duties

Setting the framework:

- establishing market rules for competition
- regulating network tariffs

Exercising market oversight:

- identifying and remedying competition violations
- tracking and analysing market development

Regulation has two main elements: ex-ante regulation involves determining the rules for competition in advance. This includes network tariff determination and the development of the market rules in consultation with market participants.

In the event of a breach of these rules or of the overall rules governing competition, the regulatory authorities may intervene by means of ex-post regulation and identify and put an end to any infringements. In such cases, E-Control cooperates closely with the Federal Competition Authority and Federal Cartel Prosecutor. An important element of E-Control's role is market oversight. Market monitoring allows tracking and analysing developments on the market.

Metering

Reading and transmitting metered data is indispensable for customer billing, forecasting and supplier switching. Installation, removal and maintenance of metering equipment as well as meter reading and transmission of the data to the relevant market participants are all duties of the DSO.

Electricity market

The metering point administration number - By way of metering point administration numbers (MPANs), each metering device can be identified. The system operator must ensure that each MPAN (this may be the device number or the geographical coordinates, for instance) in its grid area is unique – even if a metering point ceases to exist, its MPAN may not be assigned elsewhere again. Also where changes to the system operator's legal setup, changes to the postcode and replacement of the metering equipment occur, this requirement continues to apply.

Meter types

Flow metering devices - Such devices are usually installed at the facilities of small consumers or producers (with an annual consumption/production of less than 100,000 kWh or with a connected capacity of less than 50 kW). The exact type of device depends on what needs to be metered; this is, in turn, determined in the system access contract concluded between the grid operator and the customer.

The options are:

- Alternating current (AC) meters;
- Three-phase meters; and
- Multiple-tariff meters.

Load profile meters - At all facilities with an annual withdrawal/injection of over 100,000 kWh and a connected capacity of over 50 kW, the grid operator must install load profile meters. If these thresholds are not reached for three years in a row, grid users may request that load metering be stopped and they again be assigned a standardised load profile. Load profile meters are usually read remotely and on a monthly basis.

Quarter-hourly maximum meters - This type of meter records the electric energy consumed as well as the highest quarter-hourly mean load that occurs during a given period of time. The thresholds for the installation of quarter-hourly maximum meters vary among system operators and are laid down in their General Terms and Conditions (GTC). Normally, they are used for larger customers that do not meet the thresholds for load profile meters. Customer facilities that have quarter-hourly maximum meters are still assigned standardised load profiles.

Smart Meters – These are only installed at household customers and small/medium commercial customers. They also record a load-profile (15 minute values) and additionally provide one extra value per day. The regulator has determined the minimum requirements of smart meters in 2011.

Natural gas market

The metering point administration number - By way of metering point administration numbers (MPANs), each metering device can be identified. The system operator must ensure that each MPAN (this may be the device number or the geographical coordinates, for instance) in its grid area is unique – even if a metering point ceases to exist, its MPAN may not be assigned elsewhere again. Also where changes to the system operator's legal setup, changes to the postcode and replacement of the metering equipment occur, this requirement continues to apply.

Diaphragm meters - Diaphragm meters are displacement meters where the flow channels are designed to guarantee optimum flow conditions and a low pressure loss. They are suitable for measuring the volume flow rate of natural gas and a variety of technical gases at up to 0.5bar. The approved gas temperature range is -20 °C to +50°C. Versions for higher temperatures and pressure rating are also available.

Load profile meters - At all facilities with an annual consumption of over 400,000kWh, a meter bigger than G100¹⁰ and a pressure above 100mbar at the metering point the grid operator has to install a load profile meter. If these thresholds are not reached for two years

¹⁰ G 100 is a unit of measure - defined measure of min / max flow according to the OIML (Organisation Internationale de Metrologie Legale) directive, i.e. this metering device has a minimum flow rate of 8 m³ / h and a maximum flow rate of 160 m³ / h. The measure, however, does not give any information about pressure or nominal diameter.

in a row, grid users may request that load metering be stopped and they again be assigned a standardised load profile.

Standardised load profiles

Electricity market

The legal framework foresees that standardised load profiles (SLPs) be drawn up for customers with an annual withdrawal/injection below 100,000 kWh or a connected capacity below 50 kW. In Austria, the SLPs developed by the German Association of Energy and Water Industries (BDEW, formerly: VDEW) are used. However, not all customer types are covered by the BDEW's profiles, so E-Control and OesterreichsEnergie (formerly: VEÖ) jointly established SLPs for these typical Austrian situations:

- Injection from hydropower, wind power or biogas facilities;
- Injection from PV plants;
- Interruptible supply;
- Facilities with remotely controlled capacity reduction options at a single metering point;
- Mobile phone stations; and
- Public lighting.

Assignment of SLPs to grid users is done by the grid operator. The SLPs used in Austria are administered by the clearing and settlement agent (CSA) and published and updated on its website.

Natural gas market

According to the "Load profile decree" (Lastprofil-Verordnung 2008) standardised load profiles have to be drawn up for network users if the pressure at the metering point is below 100 mbar and the yearly consumption is lower than 400,000 kWh and the meter is smaller than G 100.

Gas consumption is subject to heating load profiles, according to the average temperature of a day. There are 21 temperature zones for Austria and also process load profiles, which are independent from the temperature, but are determined by the weekday.

Heating load profiles:

- single family household
- multiple family household
- business

Process load profiles:

3 Types of days:

- Monday until Friday
- Saturday
- Sunday and bank-holiday

For each in three time zones (corresponding to the seasons)

- winter (1 November until 20 March)

- junction (21 March until 14 May and 15 September until 31 October)
- summer (15 May until 14 September)

Assignment of SLPs to grid users is done by the grid operator. The SLPs used in Austria are administered by the CSA and published and updated on its website.

Electronic exchange of billing information

Vertically integrated undertakings usually issue combined bills for network charges and energy cost to grid users. To enable new suppliers to also issue such combined bills, network operators are obliged to send the respective supplier the required information relating to its consumers. The efficiency principle requires that the information provided by the network operator to the supplier follow a predefined electronic format. This minimizes the administrative effort required of the suppliers and promotes automated processes for combined billing.

The format chosen for this purpose builds on the international open standard extensible Markup Language (XML). Based on this, the harmonised ebUtilities format has been developed. It meets the requirements for the contents of bills and includes a digital signature.

2.1.2. The data management model

In Austria, the general data management model in the energy market (in both electricity and gas) is organised in a decentralised way. There are many kinds of different data exchange, all based on standardised data formats determined by the regulator. Most of this data exchange is regulated through "market rules" or is based on binding legal requirements. Examples of these data flows include: electronic bill exchange, supplier switching (until the end of 2012), clearing-purposes and energy schedules.

From 2013, there will be a new "supplier switching platform" designed to manage the data flow between the DSO, the old and the new supplier as a "data hub". This platform will not act as centralised data storage since all customers data will be stored at the systems of the responsible market participants and will only be exchanged via the platform in a standardised format. In addition, the platform is not intended to be used to exchange advanced smart meter data at present.

In connection with smart meters there are several legal regulations in force since 2011. The prerequisite is, of course, the installation of smart meters, but in Austria there are few households who have installed a smart meter. Therefore regulations relate to a future situation and will oblige the DSO to provide customers (households and small industrial customers) with the daily measured metering data via a web portal.

The metering data will have to be transferred from the DSO to the customers' supplier once a month in a standardised data format (which will be determined by the regulator). The supplier is obliged to generate an information sheet about consumption and the related costs based on a monthly data basis. The regulator has the authority to legally determine the minimum requirements of smart meters and the minimum content of the information provided for the customers (from both the DSO and supplier) and the data format used.

2.1.3. Customers

Who owns and controls the data

In general, network operators have control over final customers' data and, therefore, are responsible for data protection. According to the Data Protection Order, access to consumers' data by third parties is only possible upon approval by the customer.

The clearing and settlement agent (CSA) operates a communication system (the so-called "supplier switching platform"), which ensures a standardised and automated data exchange between IT systems of market participants. This exchange platform serves as a common data interface only and, therefore, does not save any kind of customer-related data. All network operators and suppliers registered in Austria gain access to this exchange platform. The CSA logs all logins to the exchange platform as well as all processed transactions (data with regards to content excluded) to ensure transparency and confirm that the system is operating successfully.

The logging of these processes through the exchange platform facilitates quick and transparent tracking of processes both during the period of supplier switching and after completion of the switch (e.g. in case of a dispute settlement procedure).

Information provided to customers

According to the new Switching Order, the new supplier has to inform the customer immediately of the anticipated switching date.

The introduction of smart meters will be accompanied by the creation of a web portal, which will be located at the network operator, and which will allow customers to access their meter reading. The energy supplier will be obliged to inform customers in written form about their consumption figure and the related costs. The design and structure of this free-of-charge information is defined by E-Control. Customers without smart meters, will be informed about their consumption data through their standard (yearly) bills. In this context (customers without smart meters), it will be possible for the customer to forward their consumption data to the DSO quarterly. DSOs are then obliged to use this consumption data for consumption information added to the bill.

Benefits to customers

Up to now a customer was only able to switch the supplier on the first of each month. In the future however, supplier switching can be undertaken by the customer on any day of the year. This means that customers even have the ability to select a desired date for supplier switching. From a customer perspective, the "perceived" switching period starts after submitting the signed supply contract and includes the processing time of the new supplier as well as the three week statutory switching period. The future situation will simplify the switching processes.

2.1.4. Rationale for using a centralised or decentralised communications model

In Austria, all data flows are organised in a decentralised manner. Some reservations were expressed by consumer and data protection organisations and the market participants in connection with storing consumer data (especially metering data) in a centralised data

platform. For several sensitive parts of the communication processes, especially in connection with supplier switching and smart metering, there is no legal basis to store data in a centralised way.

2.2. Belgium

2.2.1. Market overview

Regulatory regime

From the start of the liberalisation of the electricity and gas market in Belgium, strong emphasis was laid on legal unbundling. Therefore, there are no vertically integrated companies. In every region (Brussels-Capital Region, Flemish Region and Walloon Region) and on federal level, legislation is slightly different but commonly states that the DSO has to be independent of producers and suppliers or any company connected with a producer or supplier. The public sector is a major shareholder (70% to 100%) in DSOs.

The regional regulators are mandated to regulate DSOs apart from tariff-setting, which is at the moment a task for the federal regulator. When dividing suppliers and network operators, a market model was developed through which standardised nationwide communication of metering data was put into place. The regional regulators are part of the steering committee of a market platform (suppliers and DSOs) which elaborates detailed communication rules for each individual market process. The regulators can (through legislation or technical regulations) impose changes in communication and closely monitor the strategic decisions made along with the detailed elaboration of these decisions.

A uniform, nationwide and standardised communication platform is of vital importance for a well-functioning market. Since policy however may differ from region to region, sometimes specific communication is necessary. For some processes (such as specific procedures for vulnerable customers) communication is provided at regional level.

Introduction to gas and electricity markets

Belgium has two TSOs (one for electricity and one for gas), 18 gas DSOs and 27 electricity DSOs. In addition, gas and electricity DSOs are often one and the same. In order to benefit from economies of scale, DSOs tend to work together. This cooperation resulted in the founding of “working companies” through which working orders and metering activities from different DSOs are bundled. As a result, a handful of “working companies” dominate the Belgian DSO landscape.

The electricity market is, on production side, dominated by 1 dominant producer. Although swaps and mergers reduced the dominant position, this remains a potential threat for market functioning. The increase of cross border capacity and the further development of a trading platform stimulates the market functioning.

Belgium has no gas production and therefore depends on imports. Nevertheless, it has a very high number of gas connections. Over the last year, the gas market has seen an increasing level of competition through an increase of capacity and better working of trading platforms.

Retail market

With 25 electricity suppliers and 19 gas suppliers, we see an increase in offers for customers. Due to a switching rate of around 10%, we see a constant decrease in market share of the historical dominant players. The market share of the 3 largest suppliers

nevertheless remains very high (88%) and the HHI (a market concentration index) shows a corresponding high level (well above 1800-2500).

Metering markets

In the current market model, metering is one of the responsibilities of the DSOs. DSOs buy, install and maintain the meters. The metering and the other main activities of the DSOs are done by the working companies.

Gas and electricity networks

Via a device communication platform (meter operating centre), DSOs maintain the installed meters DSOs use the metering activity for managing the network. Data from the meter data management system is linked to an OMS/DMS (SCADA) system which is a computer system used by operators of electronic distribution systems to assist in maintaining the grid. Both activities, maintaining the grid and maintaining the installed meters, are linked. In the current situation a very small part of meters is read remotely.

2.2.2. The data management model

Introduction

In Belgium there are different meter characteristics. A small part of Belgian meters consists of AMR meters. These meters are automatically read and can be seen as smart meters. An even smaller number of meters are read monthly. These meters are gradually being changed for AMR meters. The majority of the meters is read yearly. All residential customers fall in this group. Every two years, a meter operator comes by and reads the meter. Every other year, the customer is asked to fill in a meter value (by meter card, telephone, or internet). The meter will also be read by the customer when he or she moves, changes supplier, etc.

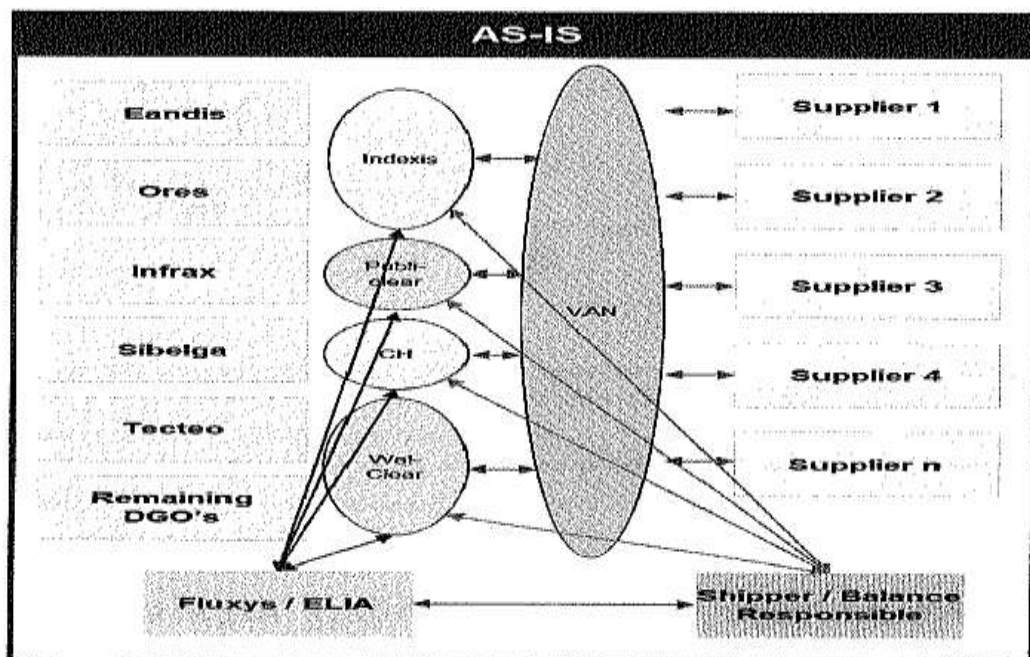


Figure 2.1: Belgium - current metering model

Key stakeholders and their roles - description of who does what

Current situation:

- Meter installation: DSO
- Meter maintenance: DSO
- Meter reading: DSO
- Meter data management: a register of connections, the access registry and the individual meter data is held by every individual DSO. Only the DSO has meter data access directly from the meter (in case of automatically read meters).
- Meter data validation: DSO
- Making data available through portal: DSO
- Suppliers have to send certain data through the portal in order to modify the access registry (master data such as name and address, switch, etc.)

DSOs use information on nominations from the TSO (Elia/Fluxys) and information on network repair, working orders and forecasts of local production in order to keep the network operational. This can result in the DSO having to send signals from the DMS/OMS system to different devices (to enable, disable, regulate, and read). Validated meter data received from the meter is used for grid fee billing and is, through a web portal (VAN), made available to the different market players (suppliers). The suppliers use this information together with the grid fee bill to bill the customer.

The communication from and to the web portal (VAN) depends on the individual market processes.

As stated above, a uniform nationwide and standardised communication platform has been operational since liberalisation. The communication rules are specified in UMIG documentation¹¹.

In view of the possible introduction of a large number of smart meters, market processes will most likely have to change. In this respect, one central access register (where there are now as many access registers as there are DSOs) could be made. It is still the individual DSO who will hold a database with the detailed metering data. The DSOs have to give the data that is necessary to the data hub, Atrias, who will have the access register. One single access register will largely simplify procedures (as changing tariff periods etc.) to make new products and services possible in the future when smart meter data is available. The intention (under discussion for the moment) is that Atrias will receive all the quarterly reads for electricity and hourly reads for gas (if there is a smart meter installed) and will give the data to the market parties with respect to the legislation (i.e. if a customer has to be given monthly consumption information, Atrias will give this information once a month to his supplier).

¹¹ See <http://www.umix.info/wps/portal>

DSO as a data-administrator with a federal clearing house

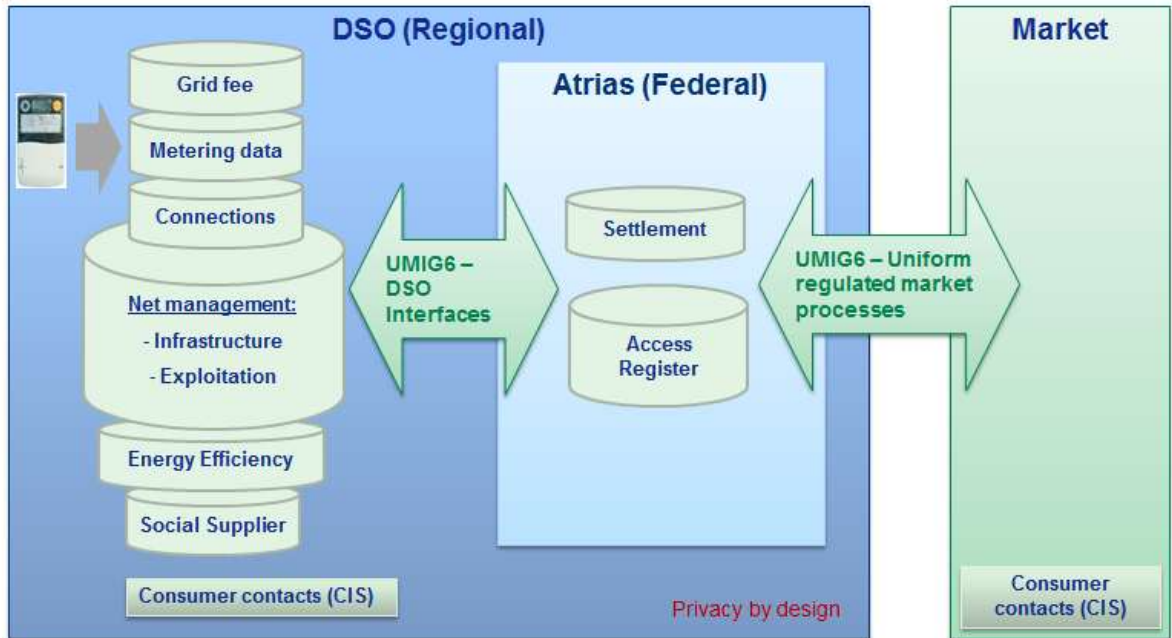


Figure 2.2: Belgium - Atrias, UMIG 6

In current UMIG 6 negotiations, smart processes will be discussed. The deadline for defining the scope is 2012. Implementation is planned in 2016.

Compared to Figure 2.1 “current metering model Belgium”, the future model will hold one central clearing house/database of access registry (figures 2.2 and 2.3).

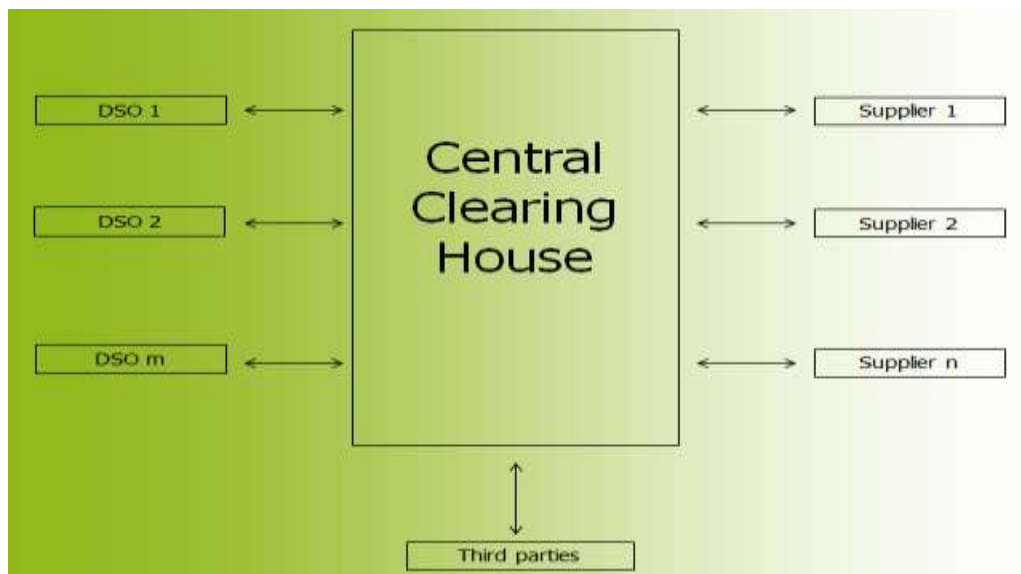


Figure 2.3: Belgium - one central clearing house

Consumers

Consumers currently receive one bill based on validated meter data. The supplier has to base his bill on the data given by the DSO. The bill is composed of the grid fee and the energy cost. On the same bill, the supplier is obliged to put the historic consumption of the last three years. The customer can ask the DSO directly (for free) for a statement of the energy consumption of the last three years (this should be given by Atrias in the future).

Government and regulator

Regional governments will decide on the framework of an eventual partial or full rollout of smart meters (at federal level – directly on transmission grid - there are only AMR meters which already are smart). Different regional regulators have been involved in preparing a market model compliant with the possible outcomes (different metering regimes). Different metering regimes have to be in place because a transitional situation will unavoidably occur. Discussions are ongoing within the steering committee of Atrias and MIG 6 regarding how to handle these different meter regimes.

Components/description of data management model/services

Belgian umix interchange agreement

The Belgian Utility Market Information Exchange (UMIX) makes protocols (MIG) on which the regulators can make remarks, this means that the MIG has to be adapted if the regulators are of the opinion the MIG isn't in line with the regional legislation. UMIK itself is organised by the DSOs and will cease to exist in July 2012. Its tasks will be done by Atrias from then on. At the moment UMIK organises market consultations through task forces and core teams and elaborates the UMIG documentation. The communication between the DSOs and the supplier is done via EDIEL messages over a Value Added Network (VAN). However, suppliers may choose to ask for a direct link with the DSOs if communication costs become too high (the supplier will send the messages via a secured web portal. These suppliers will receive the messages via e-mail and need to be able to read EDIEL for the messages they receive). The Distribution Grid Operators have concluded an agreement with an external provider for the delivery of the VAN services.

This agreement is also based on the EDIEL model and describes the rules that apply to electronic data interchange based on the EDIEL framework, as well as the use of the VAN. Interchanges should take place on certain conditions, and no other bilateral agreements should be agreed upon. It is the intention that the agreement shall function as a standard agreement for the use of electronic data interchange (EDI) based on the Belgian UMIG/EDIEL framework.

According to technical regulations, suppliers are obliged to use the specific protocols. On the other hand, DSOs are obliged to give qualitative information in a timely manner. Critical performance indicators specify within which period and with what accuracy validated meter readings have to be sent. Suppliers can get a penalty if they make illicit use of messages or protocols.

The new smart meter protocols are under discussion within Atrias.

2.2.3. Customers

Who owns and controls the data

At present, DSOs are authorised (within their legal duty) to collect a meter reading once a year (and also for some processes like a resident moving out). This meter reading is used to calculate the grid fee and the price of the energy consumption on the supplier's bill.

In a smart meter context, a lot of data will be available. From this perspective, new legislation has to be made which describes the specific purpose and authorisation of data use. The basic principle is that the customer owns and is in control of the data. Data can be used only with the specific consent of the customer. An exception is made for specific processes (billing, grid management) with legal validation.

Privacy and consumer consent

Every data handling party has to have a privacy policy and has to be compliant with national privacy legislation. In defining smart processes and creating the data environment, privacy is an element of the design.

Suppliers, distribution companies and third parties

Suppliers are the single point of contact for consumers and make one bill incorporating the grid fee of the DSO. Through a mandate of the customer, third parties can obtain metering data from the DSO. There are at the moment no specific critical performance indicators for the DSOs to give the metering data to the third parties (metering data for market processes). In the future Atrias will probably be the contact point for third parties.

Information provided to consumers

Customers receive their past consumption (the last 3 years) on the bill. On-demand information can be received through the DSO. In a future smart grid context, a portal will be available for the customer to download data directly from the meter. Data used in market processes can be checked at the DSO (grid management) and at the Atrias database (access register and market data).

Risks and benefits for consumers

The future smart meter situation could simplify current processes (switching, moving, prepayment, etc.) and improve customer participation (energy saving, new products and services, etc.). Furthermore, smart metering can have a benefit in grid management and facilitate the introduction of market mechanisms to increase the introduction of renewables in the grid with minimal capacity investments. On the other hand, the potential roll-out of smart meters may increase the complexity of pricing policies for consumers, through the increase in the number of tariffs formulas. There is no evidence that the costs of the roll out of smart meters will be supported by those who will benefit from smart meters.

2.2.4. Rationale for using the central communications model

Advantages and challenges of the model

The new model will enhance and consolidate a level playing field, not only for suppliers but also for new third party services. The centralisation of the access register simplifies the introduction of new services (ToU, Demand side management...).

Grid management, as well as government policy, can benefit from better data management (support to renewables, energy efficiency schemes, and increase in decentralised production, etc.). A uniform data system will add to the simplicity of regulation and data protection control. The storage of data (validated meter data) used in commercial market processes (billing, etc.) would be centralised. Data for grid management and meter management use would be stored in DSO-specific storages.

A challenge is inevitably to keep the cost of the model in relation to the benefits it can offer. The roles and responsibilities as well as the regulation have to be in place regardless of the chosen model.

2.3. Denmark

2.3.1. Market overview

The national frameworks and goals for the energy sectors are undergoing change. The new energy policy agreement has set the framework for Danish energy policy from 2012 to 2020. The agreement entails a large number of initiatives which will affect the market, and includes, amongst others things, drawing up a comprehensive strategy for establishing smart grids in Denmark and an agreement with grid companies on accomplishing the roll-out of remotely hourly readable electricity meters.

The Danish TSO, Energinet.dk, is certified as being unbundled. Energinet.dk is responsible for the electricity and natural gas systems, and owns the overall energy infrastructure. The main tasks are to ensure reliable energy supply and create the framework for well-functioning energy markets and effective integration of renewable energy. Energinet.dk is also responsible for establishing a Datahub, which amongst other things, is expected to back up the energy plan.

The certification requirement also applies to regional transmission companies in the electricity sector, which have recently been purchased by Energinet.dk, thus resulting in synergies for Energinet.dk and entailing a shift from efficiency regulation of the regional transmission companies to non-profit regulation.

Electricity Market

The players in the electricity sector are producers (power plants), trading companies (including trading companies with a supply obligation licence), transmission companies and distribution companies.

A number of trading companies have a supply obligation licence which obligates them to supply electricity to all customers within their area who have not changed electricity supplier. Since the liberalisation of the electricity market was finally completed in 2003, all electricity consumers are free to change supplier. About 15% have chosen to change up to now.

The trend towards increased use of hourly consumption meters in households and towards electricity prices varying over the hours of the day is expected to strengthen market functioning. Consumers' interest in using the free electricity market, however, should also be seen in connection with regulation of the prices of supply obligation products and the relatively modest proportion of the actual price of electricity compared with the total price consumers pay for electricity, i.e. nearly 60% of the price represents taxes, etc.

Electricity grids are owned and operated by the grid companies (DSOs) on the basis of an authorisation from the Danish Energy Agency. The authorisation entitles the holder to a monopoly on supplying electricity transport within the authorisation area. Energinet.dk owns and operates the main transmission grid of 400 kV with a total length of approximately 6,000 km and the regional transmission grid with a voltage level of 150-50 kV. The DSOs are subject to price revenue regulation, and Energinet.dk is subject to non-profit regulation.

The wholesale model by 2014 - electricity market

The Danish Parliament passed a bill on implementing the wholesale model in Denmark on June 18, 2012. The wholesale model will be functioning from October 1, 2014.

Under the new wholesale model, the electricity retail suppliers become the central players on the electricity retail market. They will buy electricity from an electricity exchange such as NordPool, from electricity wholesale traders or directly from electricity producers (wholesale market). The suppliers will buy grid services from the relevant DSOs and buy the TSO services from the TSO. The suppliers will sell “delivered electricity” to the consumers, i.e. including both supply and transportation of electricity, relevant taxes and duties, etc.

The electricity retail suppliers will be the main point of contact for consumers regarding delivery of electricity. They will manage all aspects of consumer administration, they will inform the consumers about their consumption and they will be the first point of contact for consumers’ questions and complaints, also regarding grid related issues. They will be obliged to run a 24 hour consumer service, but may carry out this task jointly with other electricity retail companies. Where a question is of a technical, grid-related nature, the electricity retail company is obliged to forward the question to the relevant grid company without delay. The grid company will then proceed to solve the problem.

The DSOs will not lose all consumer contact. They will maintain responsibility for connecting the consumers to the grid, including receiving payment for the grid connection, and be responsible for metering the electricity. However, the main task of the DSOs will be to ensure the security of supply by maintaining, and where needed developing, the technical operability of the grid. Bills will be issued by the retail suppliers - all included, also for the consumers’ use of the grid.

The DSOs will sell their services to the electricity retail suppliers, just as the Danish TSO, Energinet.dk, who will no longer sell its services to the grid companies, but to the electricity retail suppliers directly.

A fundamental prerequisite for the wholesale model is the data hub, which at the time being is in a test phase and is run by Energinet.dk as shown in the figure below in figure 2.4 and 2.5. The data hub will start 1 March 2013.

Natural gas market

The natural gas sector in Denmark includes generation, transport and trading in natural gas.

The regulation is very similar to the regulation of the electricity market. Natural gas on a supply obligation basis is supplied by a number of natural gas companies. They have been granted a supply obligation licence by which they are obliged to supply natural gas to all customers in their licence area who have not changed natural gas supplier.

The transmission system consists of the main stations and pipelines connecting the production units to the distribution networks.

The distribution grids are owned and operated by the three distribution companies in the natural gas sector - DONG Distribution A/S, HNG/Midt-Nord I/S and Naturgas Fyn A/S.

These companies act on the basis of an authorisation from the Danish Energy Agency. The authorisation entitles the holder to a monopoly on supplying transport within the authorisation area.

Energinet.dk owns and operates the 860km high-pressure pipeline system in Denmark. Energinet.dk also owns the installations which meter and regulate the gas and send it into the gas distribution network. Finally, Energinet.dk owns the Lille Torup gas storage facility near Viborg in Jutland

The distribution companies are subject to a price revenue regulation, and Energinet.dk is subject to a non-profit regulation.

Metering

Newly installed meters must comply with certain technical requirements aimed at supporting the spread of intelligent and time-flexible electricity consumption patterns and electricity savings. These meters must comply with the *Executive Order on metering electricity in end consumption*. Intelligent and flexible electricity consumption is required in order to incorporate more wind power and electric cars into the electricity system.

Meter requirements concern the information the meter is to measure and record, as well as the consumption data that is to be communicated to the consumer. At first, meter requirements will apply to meters that can measure consumption at short time intervals, that can be read remotely, and that the grid companies decide to replace at their own initiative. Thus these requirements do not apply to existing meters or in situations where the grid company decides to replace an existing meter with an electricity meter that can only measure the accumulated consumption.

About 60 % of the Danish consumers have newly installed remotely readable meters.

The Danish Data Protection regulation

The Act on Processing of Personal Data implements EU-Directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free movement of such data. The Act on Processing of Personal Data is under the authority of the Danish Data Protection Agency, who has the responsibility to ensure that the law is abided by.

The Danish Data Protection Agency receives notifications and authorisations of some of the more sensitive processing of personal data that is performed by authorities and companies.

The Danish Data Protection Agency can also take up cases of its own initiative, for example, due to a citizen enquiry or newspaper article, the agency suspects a violation of the regulations of the Act on Processing of Personal Data.

The Danish Data Protection Agency may in its decisions issue criticism if the controller has violated the regulations of the Act on Processing of Personal Data.

The Danish Data Protection Agency conducts an annual series of inspections of public authorities and private companies that have received the agency's authorisation to process

personal data. The Danish Data Protection Agency examines whether the processing of data is carried out in accordance with the Act on Processing of Personal Data.

If the Danish Data Protection Agency discovers punishable violations of the Act on Processing of Personal Data in connection with handling a complaint or an inspection, the Danish Data Protection Agency is authorised to issue a ban or enforcement notice or report the violation to the police. Energinet.dk has forwarded the Agency their terms and procedures for data collection.

Fundamentally, the data in the Datahub are the same, as has always been registered by the grid companies. The only difference now, is that they are (also) registered in the TSO owned Datahub. As such the Danish Data Protection Agency has had no objections, although they do point out that Energinet.dk is the data responsible party concerning data registered in the hub.

2.3.2. The data management model

The TSO, Energinet.dk, is responsible for establishing and handling an electricity Datahub at national level. The conditions for access to the Datahub are set according to methodologies which must be approved ex ante by the regulator according to the Electricity Supply Act.

Consumers have the right to access their data in the Datahub, and no additional costs may be charged to the consumer for that service.

The Datahub is expected to go live by 1 March 2013 and, for a transitional period until the wholesale model is in effect by 1 October 2014, will to some extent still function according to the existing market design, i.e. the customer receives bills from his DSO / supplier-company or from two companies respectively his supplier and his DSO. There is, however, one distinctive difference from the existing model during the transitional period, as all supplier switches will be handled in the Datahub. The Hub in the transitional period may be illustrated as follows:

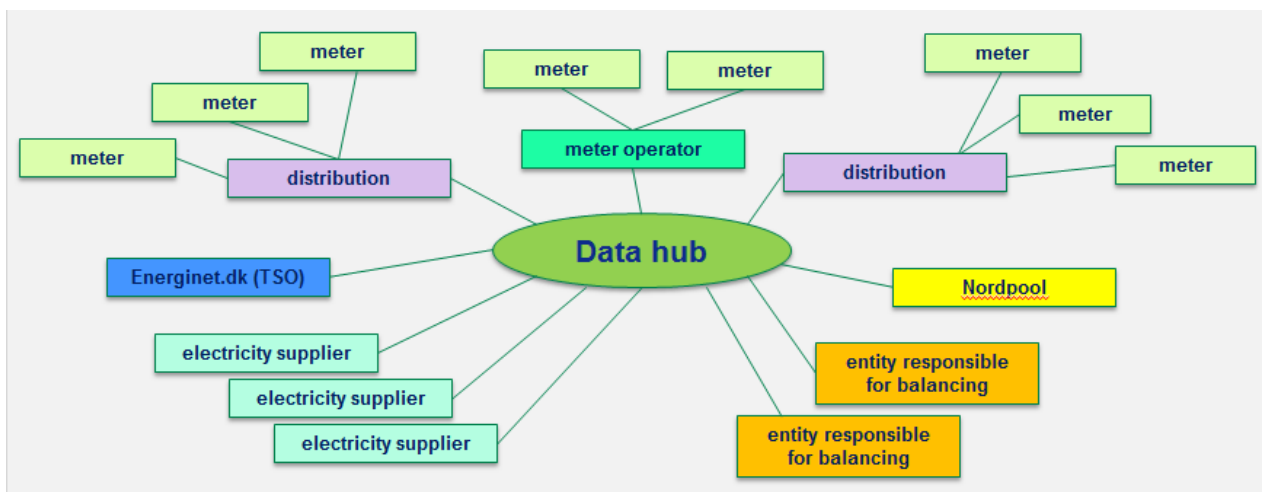


Figure 2.4: Denmark - The Data hub in the transitional period until 2014

With the wholesale model by 2014, the hub will be adjusted. In this model the electricity retail suppliers become the central players on the electricity retail market.

The data flow will be as follows:

The DSOs will feed the following meter-specific information into the data hub:

- identification of meter, including meter number and address, etc.;
- grid tariffs related to the meter; and
- metered readings specified per meter.

Energinet.dk will feed in:

- the TSO tariff;
- costs for public service obligations (PSOs); and
- information received from the tax authorities regarding tax-related issues, such as applicable tax rates etc.

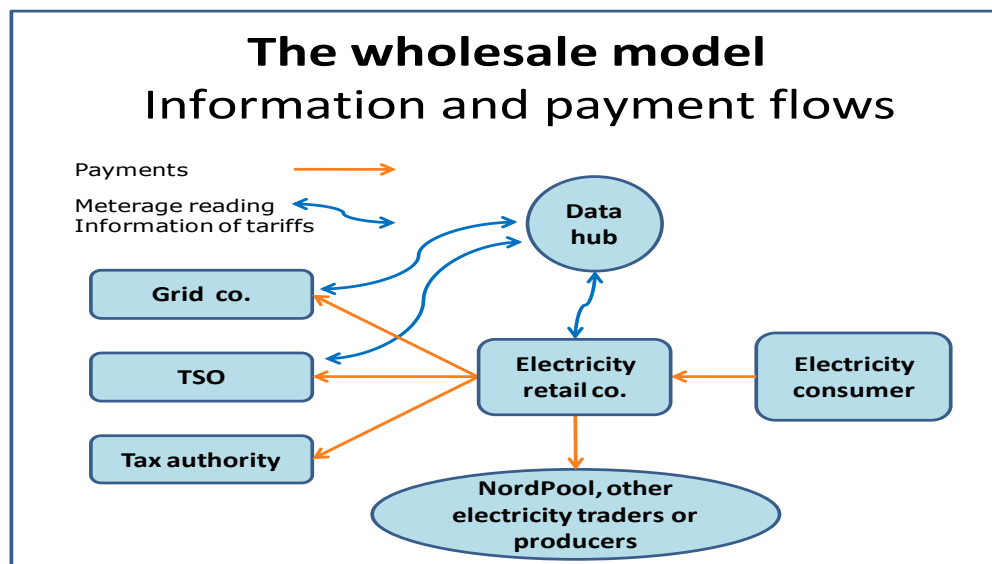


Figure 2.5: Denmark - The wholesale model by 2014, information and payment flows

Electricity retail suppliers will feed in:

- information on the consumer using each meter, including special tax conditions related to the consumer, such as, for example, tax reductions for consumers using electrical heating.

On the basis of the information submitted by the various parties, the Datahub will calculate:

- the necessary billing information for each consumer;
- the amount that grid companies and Energinet.dk can bill each electricity retail supplier; and
- the amount due to the tax authorities.

On the basis of this information, the DSOs and Energinet.dk will bill the electricity suppliers on a monthly basis for their services. They will be billed a lump sum, not specified per

consumer. The lump sum payment is determined by the measured or calculated consumption in the previous month.

Retail suppliers will also make payments on a monthly basis of the amounts due to the tax authorities, corresponding to the volume of electricity billed to consumers.

2.3.3. Customers

Who owns and controls data (privacy and security aspects)

Customers are, according to the Electricity and Natural Gas Supply Acts, ensured the right to receive their consumer data free of charge. Furthermore, according to the Act, the distribution companies are obliged to make this data available to the customers in a transparent, objective, fair and non-discriminating way.

Energinet.dk owns the Datahub, and is responsible for data according to the Data Protection Act. They are obliged to ensure that the consumers may gain access to their data, and the distribution companies are obliged to feed in this data.

Information provided to customers

All market actors are, according to the Electricity Supply Act, obliged to supply Energinet.dk with the necessary data to run the Datahub. According to the Act the regulator approves the methodologies ex ante, according to which Energinet.dk lay down their procedures for DSOs, suppliers and other market actors' supply of data and the right of access to data.

Customers with a yearly consumption above 100,000kWh have hourly readable meters. The threshold may be set lower according to an agreement with the customer.

Benefits to customers

The Datahub is expected to enhance and simplify data handling and supplier switches, and thus enhance competition and more efficient prices to the benefit of customers.

2.3.4. Rationale for using the central communication model

The Datahub is expected to enhance competition, simplify the approach to information, enhance transparency for consumers wishing to switch supplier, ensure more uniform practise and secure administrative relief - all to the benefit of more efficient markets.

At the same time master data and meter readings may no longer be seen as the "property" of the grid companies, as the grid companies no longer can supply affiliated supplier companies with information on forthcoming switches in their area, thus avoiding issues of unfair competition. At the same time the goals of unbundling are further secured – all to the benefit of further competition.

2.4. Germany

2.4.1. Market overview

Electricity and gas networks are regulated monopolies in Germany. The electricity transmission system is operated by four TSOs, with 50Hertz Transmission GmbH in the East and TransnetBW GmbH in the South-West; Amprion GmbH covers large parts of Western Germany and TenneT TSO GmbH a long stretch from the Dutch and Danish borders right to the Alps. According to BNetzA monitoring data, there are 866 electricity DSOs in Germany. The gas transmission system is operated by 16 TSOs and there are 707 gas DSOs.

In the electricity retail market there are currently around 1013 suppliers operating. There are 48 million domestic electricity consumers supplied at DSO level, 3 million of which have switched suppliers in 2011. This equals a switching rate of 6.5%. In the gas retail market there are currently 820 suppliers operating. There are 13.5 million domestic gas consumers supplied at DSO level.

According to the Energy Industry Act (EnWG), DSOs act as the meter operator as long as a customer does not choose a third party to operate and/or read the meter. In 2011, 866 DSOs acted as “base”-meter operators which could be understood as a “meter operator of last resort” similar to a “supplier of last resort”. There are 20 independent meter operators active who are often highly successful in the industry and SME segments of the electricity market. While the same rules apply for gas metering, meter operation by third parties is more common in electricity than in gas.

Regulatory regime

In 2005, a fundamental change of the regulatory framework was enacted through a revision of the EnWG. These legislative amendments, as well as a series of new ordinances, were designed to transpose the requirements of the second EU Internal Energy Market Package, i.e. Directives 2003/54/EC and 2003/55/EC as well as implementing Regulation 1228/2003/EC. The EnWG was revised again in 2011 to transpose the 3rd Package, namely Directives 2009/72/EC and 2009/73/EC, and to implement Regulations 713/2009/EC, 714/2009/EC and 715/2009/EC.

At the heart of the new Energy Industry Act was the establishment of a regulatory authority for the electricity and gas networks. Regulatory responsibilities are split between the national and the Federal State level. The Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen (BNetzA) is active at national level while at Federal State level each of the German Federal States may establish its own regulatory authority. Federal State responsibility requires that the network does not cross a Federal boundary or that fewer than 100,000 customers are connected, either directly or indirectly. BNetzA is in any case directly responsible for transmission systems and for cooperation with the regulatory authorities of other EU Member States, the Agency for the Cooperation of Energy Regulators (ACER) and the European Commission.

The regulatory authority is generally charged with establishing non-discriminatory third-party access to networks at charges that are fair and efficient and at the same time ensuring that

the grid-based supply of electricity and gas to the general public is as secure, reasonably priced, consumer friendly, efficient and environmentally sustainable as possible.

2.4.2. The data management model

To date, meter data has been relevant for three purposes:

- Balancing the amount of energy produced and consumed at transmission level;
- Billing of the network tariff between DSO and supplier (in the case of household customers); and
- Billing of consumed amount of energy between supplier and domestic customer.

The DSO receives the meter data from the meter operators. The DSO validates the data and sends it to the TSO and supplier for balancing (monthly) and to the supplier for billing of the network tariff (annually). The meter data exchange is regulated by standardised processes which were established by BNetzA in consultation with stakeholders (especially suppliers and DSOs). Such processes are abstract descriptions of communications between market participants (supplier, DSO, TSO and meter operator). They constitute mandatory rules, specifying time limits, data protocols and the communication sequences between the relevant stakeholders for each process. Three main processes have been created by BNetzA:

- Switching (“*GPKE*” – processes for supplying consumers with electricity) – important for seamless and timely switching of supplier (since 2006);
- Metering in context with a third party as metering operator (Wechselprozesse im Messwesen, WiM) – important for seamless and timely switching of metering operator (since 2009); and
- Balancing (“*Mabis*”) – important for seamless and timely accounting and billing of energy consumed and produced per control area (since 2010).

The figure below shows the current configuration for meter value management:

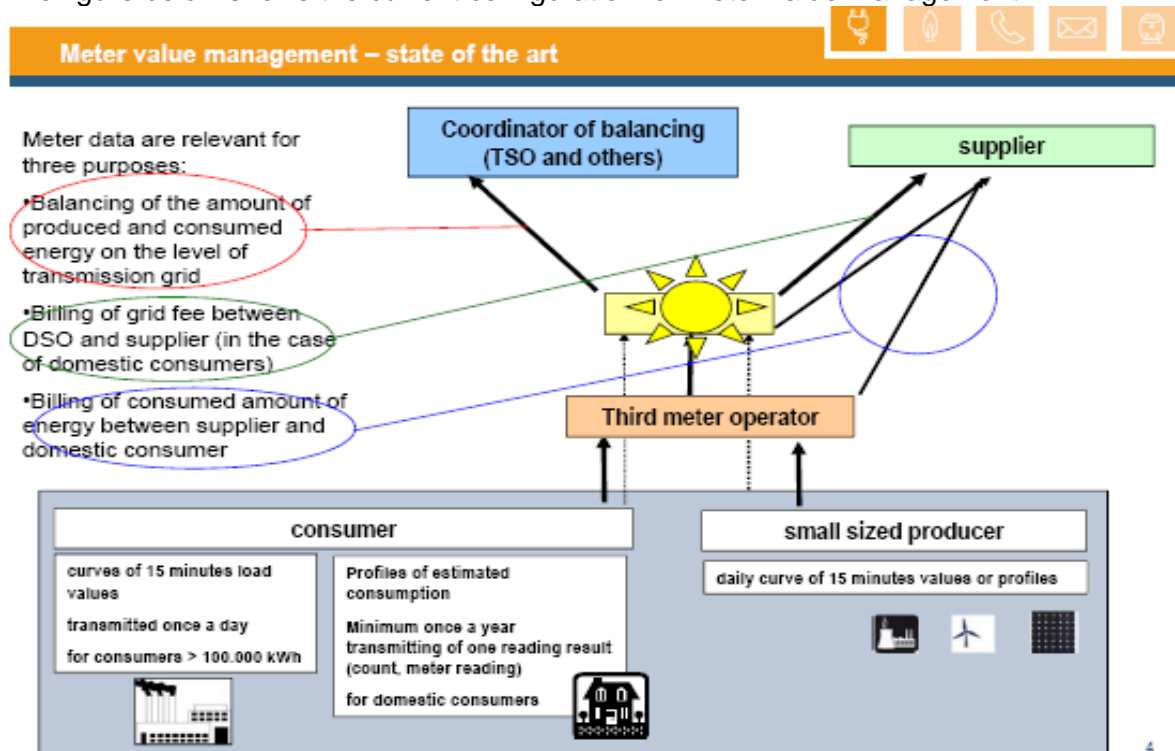


Figure 2.6: Germany – Current Meter value management configuration

To date, each DSO constitutes a relevant data hub in the data communication between the stakeholders for the purposes of billing and switching because the processes make DSOs responsible for validating and sending the data on time. Apart from this, there is a possibility for the consumer to enter into an agreement with his supplier or service provider for data to be sent directly between meter operator and supplier for purposes of for example monthly billing or displaying consumption for purposes of energy efficiency in a shorter time interval via another medium. In these cases there are no special process rules.

It has taken substantial time and cost (for each of the around 1000 suppliers and 900 DSOs) to install and to establish these processes. A pre-condition for success is the existence of capable IT systems with each stakeholder, with the result that manual data exchanges are no longer applied.

2.4.3. Customers

In the era of Ferraris-meters privacy issues have not been highly salient because consumption was established once a year only and it hence covered the amount of consumption of one year. Due to the new technical opportunities, it is now easier to gain insight into more detailed data (especially time intervals) of consumption. Data protection authorities and consumers are more sensitive because of experiences in the telecommunications sector. In Germany, data protection concerns must be considered early on in the design technical solutions and the preparation of legislation.

Privacy considerations start with the basic proposition that a meter reading must be understood as personal data because it is always related to an "ID", for example the meter ID which guides back to an address or to the meter. The owner of the data controls the data, i.e.

who will get access to which data for which purpose. This consumer's decision has to be expressed in contracts with the energy market participants.

Traditionally, when one reading was taken per year containing information on the amount of consumption during that year, there were no special rules. In future, however, new requirements will arise as consumption will be determined more frequently (several times a day) and that such data will be collected remotely. Not every stakeholder needs this detailed data for his purposes. The customer has to be properly informed about the use of his data. Explicit prior agreement before use of his data by third parties is required.

These privacy requirements are, however, not always in line with the requirements of a future flexible energy environment. A challenge arises in that conflicting objectives must be reconciled: There is a need for a more flexible energy market, in particular involving household consumers. For this purpose past meter data or additional meter readings apart from the meter readings for balancing and grid fee purposes need to be obtained. However, the more frequent and detailed the collected data must be for participation in the future energy market, the more privacy, data security and trust concerns arise.

Smart metering concerns in Germany are not limited to privacy, but extend to security as well. The public authority responsible for data security postulates that, in the future smart metering environment (including communication between commercial partners), each stakeholder's IT system (including each consumer's smart meter) and the communication over public telecommunications networks must be secure.

Against this backdrop, a project started in October 2010 to develop a technical and legislative solution for meeting three objectives in parallel: an energy market of the future, data security and data protection. A *Protection Profile of a Gateway of a smart metering system* which fulfils the criteria of these objectives has been developed by the German Federal Office for Information Security (BSI).

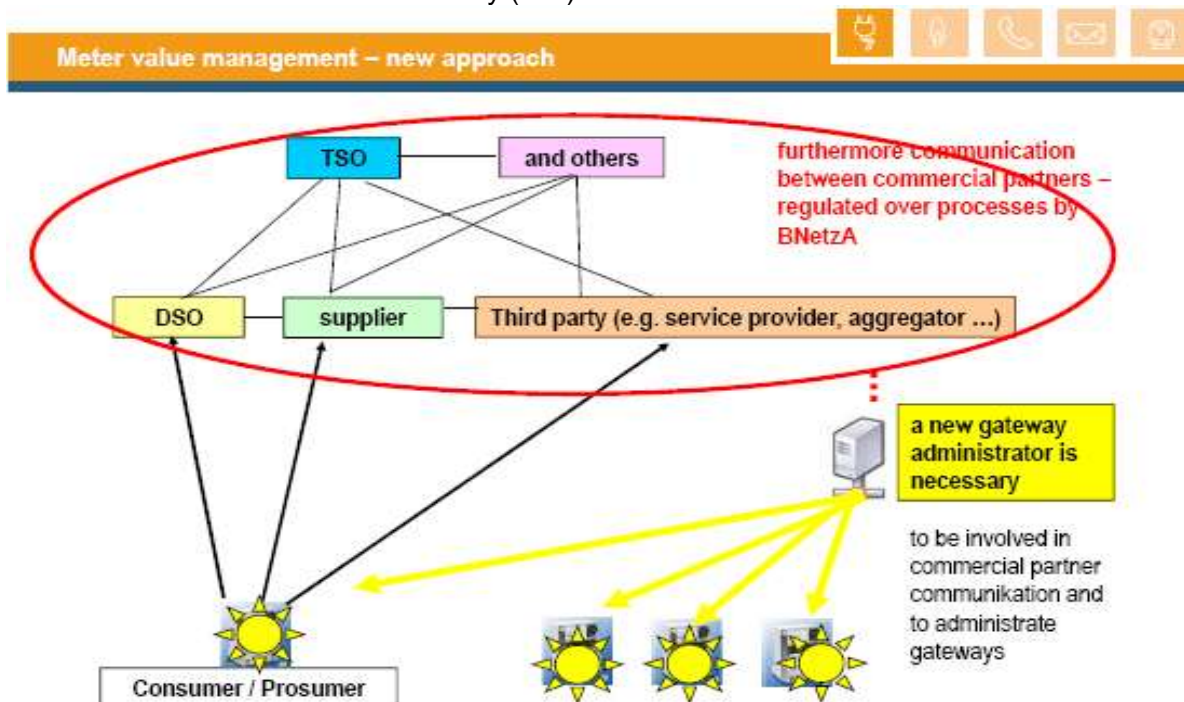


Figure 2.7: Germany – New approach towards Meter value management

A Smart Meter Gateway is designed to support communication with various external parties and the use of flexible tariffs. The standard “Common Criteria” for developing a protection profile has been chosen to use an internationally recognised set of criteria. The concept of Protection Profiles allows the definition of minimum requirements but maintains the possibility for developers to extend the functionality. Other standards (e.g. in the context of M/441) have been taken into account. Requirements on meters have been avoided in order to allow the further use of meters that are in conformity with the Metering Instruments Directive 2004/22/EC.

2.4.4. Rationale for using a centralised or de-centralised communications model

The section below describes two approaches, a centralised and a decentralised one, that are key to understanding the challenge posed by privacy and data security issue in Germany against an industry structure background of around 800 electricity DSO and 1000 suppliers.

The “centralised” approach

Many business cases and processes around smart metering build on a centralised concept. The Smart Metering system will send consumption data in high resolution to a centralised system. The system will apply tariffs, control the data and share the data with authorised parties.

BNetzA considers that this approach belongs to the “old world” where the DSO is the data hub and the supplier possibly acts as a “second” hub if he receives data because the tariffs are applied in the IT system of the supplier and not in the meter system itself.

The “de-centralised” approach

The Smart metering system itself (the Gateway to be precise) handles the data. Only results of tariffs (maybe 2 or 4 meter readings a day) are submitted to external parties. Consumers keep control over their data (at least physically) and their flows. The DSO does not necessarily have to be a data hub anymore.

The new German technical requirements support both approaches. The previous system where the data flows to and from the DSO is still applicable. The second solution to handle the data de-centralised in the Gateways of Smart metering systems could however be preferable in view of privacy and data protection issues. The de-centralised approach however causes a new question: The handling of de-centralised data in gateways requires an administrator for the gateways and it is not clear at this stage how “central” this new role should act.

At this point different understandings on how to interpret “central” and “de-central” may arise obviously. There can be a technical solution (such as a server-farm) which is the single point for all activities in the country – that would be geographically central. At the same time, there is also a possibility to have many different responsible enterprises (for example the DSOs) which are central, too, for all the parties acting in their respective network areas – that would be central in responsibility. Finally, there can be technical solutions such as gateways which distribute data to all relevant actors, hence this solution would be highly de-centralised – both geographically and in responsibility.

The advantages and drawbacks each depend on the market structure, on the technical solutions and on the legal and regulatory context.

2.5. Italy

2.5.1. Market overview

Introduction to gas and electricity markets and regulatory regime

The Italian Regulatory Authority for electricity and gas (hereafter referred to as AEEG) is responsible for regulating the energy markets by:

1. promoting competition as well as consumer protection and quality of service;
2. ensuring uniform availability and distribution of services throughout the country; and
3. establishing a clear and transparent tariff system based on set criteria.

AEEG is an independent body established under Law 481 of 14 November 1995 to regulate and control the electricity and gas sectors. Moreover, since 2012 AEEG has been regulating some aspects of water services.

AEEG makes decisions that may affect the interests of various stakeholders, such as customers, companies and business interest groups. For this reason, AEEG adopts its regulatory decisions on the basis of a consultation procedure, which helps the regulator take into consideration the different views, needs and demands of the parties whose interests are likely to be affected by the new regulation.

AEEG monitors companies' compliance with regulations and can impose fines for non-compliance as well as ordering the party operating the service to cease a behaviour which is detrimental to the rights of customers. Moreover, AEEG is responsible for guaranteeing that the rights laid down by Annex I of Directive 2009/72 and Annex I of Directive 2009/73 are respected by energy companies.

Introduction to gas and electricity markets

Preliminary remarks

Different companies, such as transmission system operators, distribution system operators and suppliers, operate in the energy sector.

Generally speaking, it is necessary to take into account the distinction between services provided by the distribution system operator (hereinafter referred to as DSO) and services provided by the supplier. The distinction between distribution and supply is established by law and AEEG regulates DSOs' and suppliers' activities. This means that suppliers and DSOs have to comply with the rules issued by AEEG (hereinafter referred to as regulation), i.e. the duties imposed on energy companies in order to promote competition, quality of service and consumer protection.

There are 144 DSOs and 381 suppliers which operate in the electricity sector and there are 247 DSOs and 231 suppliers which operate in the gas sector.

Retail market

As regards retail energy markets, each customer is eligible and free to choose his own supplier. Since 2003 the gas retail market has been fully opened to competition, whereas the

electricity retail market has been fully opened since 2007. The electricity market counts 36.6 million customers and the gas market 21.1 million customers.

The supplier is the main point of contact for the customer, even when network issues are involved. When the customer is party to a supply contract, he also has to contact his supplier to ask for the execution of works provided by the DSO. For this reason, the supplier is in charge of submitting customer requests to the DSO.

The different roles of suppliers and DSOs affect the market structure and have to be taken into account especially when one focuses on the duties and provisions addressing data management and meter reading.

Supply is fully opened to competition and suppliers generally operate nationwide. Gas suppliers act on the basis of individual licences whereas electricity suppliers do not need any licences.

Metering markets

In Italy metering services are operated under the regulatory regime issued by AEEG. They are provided by the DSO for delivery points on the distribution network and by the transmission system operator (hereafter referred to as TSO) for points on the transmission network.

The taxonomy for metering services encompasses meter installation, meter start-up, meter maintenance, meter reading, meter values processing, recording and delivery to suppliers. AEEG has set up a regulated framework addressing smart meters requirements, smart meters roll-out, meter reading frequencies, meter value management, a standardised data format and timetables for data exchange (meter value availability to suppliers and TSOs). The costs of metering services are covered by a specific “metering tariff” - charged to customers - approved by AEEG according to a price cap scheme for revenues to the metering agents (DSOs and TSOs). The new regulatory policy aims to move towards an output based charging methodology for metering services as well as that currently applied to both distribution and transmission regulated services.

As regards smart metering, Italy is the most advanced country claiming 35 million smart meters installed in the electricity sector and 95,000 smart meters in the gas sector. Italy has currently set out the installation program for gas smart metering, targeting 60% of household meters by the end of 2018. With reference to the electricity sector, Italy is about to consider the second generation of electricity smart meters addressing smart grid requirements as well as the energy efficiency requirements coming up from the work around the up-coming EU Directive.

In summary, the DSO is in charge of the following activities: meter installation, meter start up and maintenance, meter reading, meter data management, meter data validation and data availability.

Gas and electricity networks

The gas and electricity networks are split into transmission networks (high pressure/voltage) and distribution networks (low pressure/voltage), which connect high pressure/high voltage transmission systems to end users. The DSO acts on the basis of a concession and it is

entrusted with the duty to exercise, run and maintain the distribution network in a specific geographic area. Distribution is in fact a monopolistic activity.

2.5.2. The data management model

Introduction

At the moment, the Italian data management model entails the information exchange between DSOs and suppliers through a decentralised communications model consisting of direct exchanges of information between a DSO and a supplier, as shown below.

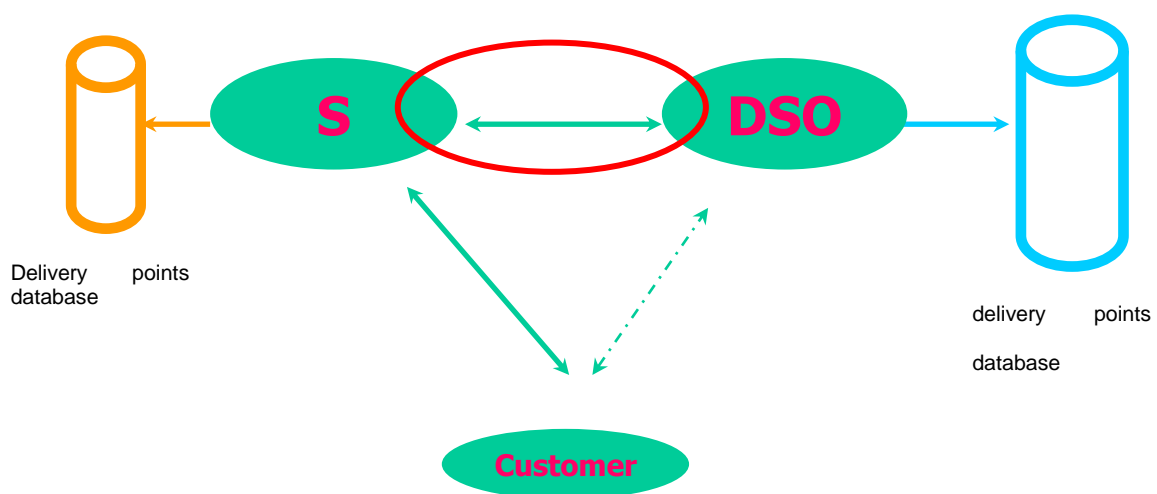


Figure 2.8: Italy - The current data management model

Key stakeholders and their roles

Consumers

Law 129 of 13 August 2010 has set up the Integrated Information System (hereafter referred to as SII) for the management of most information flows in the electricity and gas markets. The SII will be structured in such a way as to contain the database of delivery points, customer data as well as data on consumption and non payment.

The SII is expected to improve competition and transparency, provide consumers with easier and faster switching and new suppliers with easier entrance.

Government and Regulator

The SII, as set up by Law 129 of 13 August 2010, represents the change from a decentralised communications model to a centralised one, even though the information exchange between DSOs and suppliers will occur through a decentralised communications model until the above mentioned Law 129 is fully implemented.

The SII has been provided in order to promote competition and transparency in the energy markets and also on the grounds that the relationship between a DSO and a supplier may be critical. It is indeed difficult to govern data and information exchanges based on a “many-to-many” model.

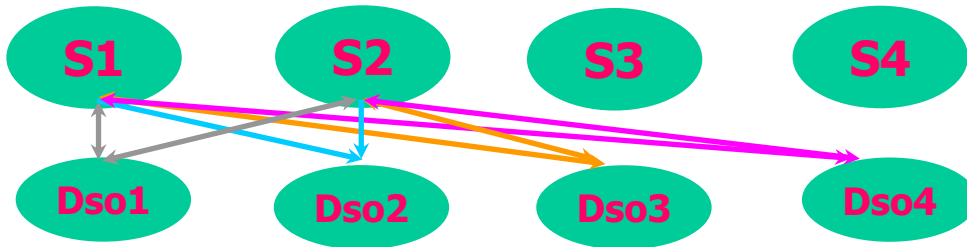


Figure 2.9: Italy - Info exchanges based on a “many-to-many” model

Moreover, such complexity may give rise to barriers for new entrants to the market and possible effects against competition (if S1 and DSO1 belong to the same industrial group, data and info flows between them might be easier than between S2 and DSO1).

According to Law 129 of 13 August 2010, AEEG plays a very important role in the implementation of the SII. At the moment AEEG’s decisions have set the general criteria for the functioning of the SII, approved the SII Code and imposed obligations on operators (DSOs, TSOs and suppliers) in order to guarantee the future functioning of the SII and of its information flows.

Components/description of data management model/services

In summary, the SII will be responsible for tracking most data exchanges with other market actors and holding the official data (currently held by DSOs). The SII will host a general database, named RCU, containing the data which is necessary to operate the following market processes for existing delivery points: pre-check, activation and deactivation, switching, activation of default services, interaction with TSOs for settlement procedures based on meter values. Moreover, as stated by Law 27 of 24 March 2012, the SII will contain data on customer consumption.

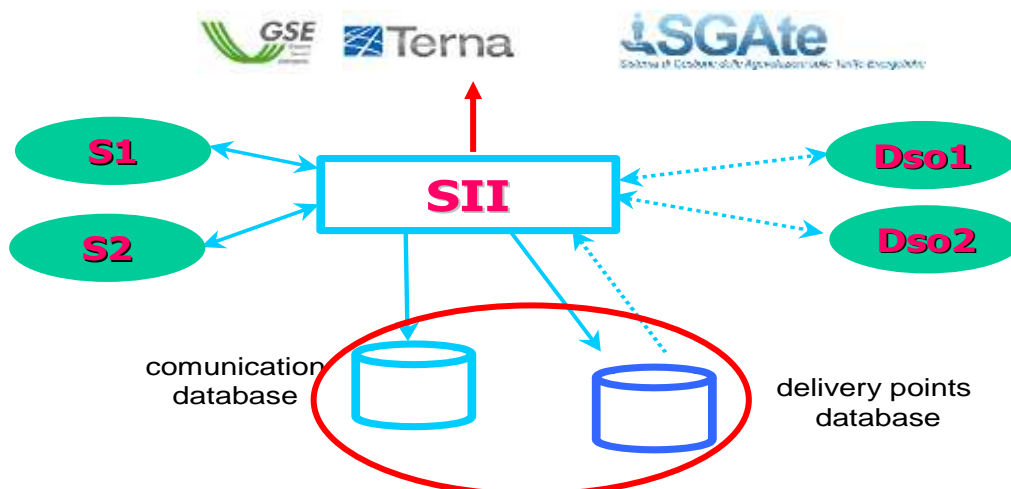


Figure 2.10: Italy - The SII data management model

The SII will manage the following processes for new delivery points: new connection and Point of Delivery (POD) assignation.

2.5.3. Customers

Who owns and controls data

Privacy and consumer consent

Law 129 of 13 August 2010 states that the SII must comply with the Privacy Code (Legislative Decree 196 of the 30 June 2003).

Consumers will be informed in advance on the reasons their data will be collected and for which purposes, and they will be aware of how their personal data is being used and by whom. Furthermore, only data that is necessary for the purposes set by Law 129 of 13 August 2010 will be captured and data should not be held onto for longer than necessary.

Suppliers, distribution companies and third parties

The fair processing of personal data by the SII and by energy operators will be assured by adopting appropriate measures. Furthermore, consumption data will not be used to get detailed information on a person's lifestyle.

AEEG will monitor the SII operation and companies' compliance with the regulation addressing the SII and will impose fines for non-compliance.

Information provided to consumers

The processing of personal data, as mentioned above, may be necessary for the performance of duties imposed by law and for the performance of tasks carried out in the public interest. However, a data subject, especially the customer, will have the right to obtain confirmation as to whether or not data concerning him exists and the right to be informed of the source of the personal data, of the purposes and methods of processing, of the entities to whom or which the personal data may be communicated and who or which may get to know said data. Moreover, a data subject shall have the right to obtain changes to the data in the form of updates, rectification or integration of the data; deletion, anonymisation or blocking of data that has been processed unlawfully, including data whose retention is unnecessary for the purposes for which data has been collected or subsequently processed.

Benefit for consumers

The SII is expected to improve competition and transparency in the energy sector and to provide consumers with easier and faster processes, especially switching.

2.5.4. Rationale for using the central communication model

Advantages and challenges of the model

In summary, the SII is bound to improve competition as well as transparency in the energy markets: it will directly manage many procedures, such as connection, disconnection,

activation, deactivation and switching, in the respect of security and data privacy and with full validity of the processes from a legal point of view.

The SII will however be implemented step by step in different stages. A first stage, encompassing the registering of operators at the SII and the transferring of minimum set of data to the SII, is ongoing and it is expected to be completed at the end of the year (2012). After this preparatory phase the SII is also supposed to be managing the first processes.

2.6. Norway

2.6.1. Regulatory regime and market overview

The Norwegian electricity market was formally opened up for competition when the Energy Act entered into force on 1 of January 1991. The Norwegian Water Resources and Energy Directorate (NVE) is in charge of regulatory tasks and surveillance of the energy market. A regulatory office (department in NVE) was set up in 1990. As regulator, NVE has played an active role in developing network regulation, real market access for all customers, easy procedures for customer switching, security and quality of supply and efficient regulation of system operation.

The development of the Norwegian market has been followed by similar market opening in the other Nordic countries, and today there is an open and integrated electricity market in the Nordic region with a common Nordic power exchange. The Nordic market is also interconnected with Estonia, the continental European market and Russia.

About NVE

The main statutory objectives for NVE concerning energy, of which the regulatory functions are a part, is to promote social and economic development through efficient and environmentally sound energy production, and to promote efficient and reliable transmission, distribution, trade and efficient use of energy.

For NVE, both for regulatory tasks as well as for other tasks, the responsibility and field of work are defined in law, regulations and decisions from the Parliament and Government and in the annual allocation letter from the Ministry of Petroleum and Energy.

NVE is delegated powers according to the Energy Act. NVE has powers to issue regulations on economic and technical reporting, network income, market access and network tariffs, non-discriminatory behaviour, customer information, metering, settlement and billing and the organised physical power exchange (Nord Pool Spot). As well as issuing regulations on system responsibility and quality of supply. NVE can take necessary decisions to fulfil the delegated powers according to the Energy Act.

NVE is the national independent regulatory authority for the electricity market in Norway. The Director General acts as regulator. NVE has no ownership interests in the electricity industry and is independent from the economic interests in the electricity industry. NVE is an independent entity with its own budget adopted by Parliament and power to act in the scope of its competences.

There is a cooperation agreement between NVE, the Competition Authority (concerning inter alia mergers, market surveillance) and the Financial Supervisory Authority of Norway (concerning the financial markets).

Norway is a member of EFTA and a party to the European Economic Area agreement (EEA). As a consequence of this, the EEA procedures regarding adoption of new EU directives apply for Norway. The electricity directive 2003/54/EC and Regulation 1228/2003 was adopted by the EEA joint Committee in December 2005. The 3rd Package will be

implemented in Norway after the EEA joint committee decision and subsequent approval by the Parliament.

Retail market

Each entity operating in the electricity market and/or in the network business is required to hold a trading license. At the end of 2011 the Norwegian Water Resources and Energy Directorate (NVE) had about 450 trading licenses under surveillance.

In Norway there is one official website for price comparison, run by the Norwegian Competition Authority. It compares the three most common contracts in the market, and about 50 % of the consumers have contracts listed on this site. The customer can easily carry out an evaluation and make the choice of supplier using a price calculator. Suppliers are required to provide information on prices and contract terms. There are no regulated prices in Norway. The first six weeks new customers who have not yet chosen a supplier (supplier of last resort) shall be served by the network company at a price that is maximal 5 øre/kWh excl. VAT (or 6.25 øre/kWh including VAT) above spot price. After 6 weeks the network companies are obliged to set the price so that the customers that have not chosen a supplier are provided with an incentive to find a supplier.

Unbundling

There is only one TSO in Norway, namely Statnett SF. The TSO has been legally unbundled in a separate company since 1992, and has to comply with the ordinary functional provisions.

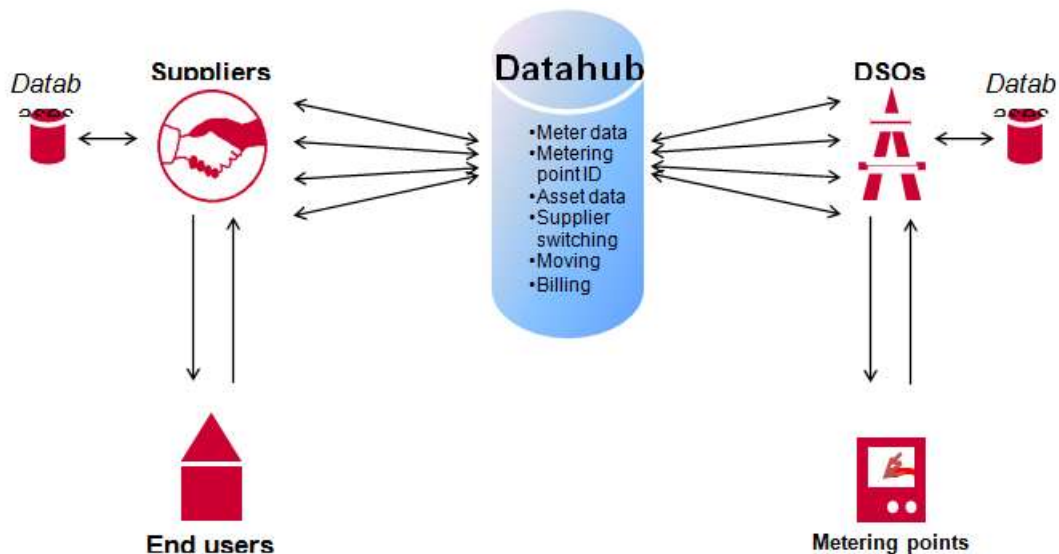
On the DSO level, the eight companies with more than 100,000 residential customers in Norway are legally unbundled. These companies cover around 60% of the total number of household customers. These eight companies are also obliged to participate in the compliance program, in accordance with the electricity directive. The compliance program serves NVE in its monitoring of the DSOs fulfilment of the provisions regarding legal and functional unbundling. Besides the eight DSOs with over 100 000 residential customers, there are an additional 34 legally unbundled DSOs. There is a total of 157 DSOs in Norway, and the majority are publicly owned. There are about 100 suppliers in the Norwegian electricity market. In general, the electricity market is fragmented due to vertical integration of network and supply and due to the many small network areas. Incumbent suppliers have a combined 70% market share overall.

2.6.2. The data management model

The scheduled roll-out of smart meters is considered a significant challenge for Norwegian DSOs, especially smaller companies with little competence on information and communication technology (ICT). Several studies have shown that common ICT solutions should be developed to ensure effective deployment of smart meters throughout the industry. In this way common ICT solutions could promote benefits from smart metering.

Currently, the electricity market uses a communication hub called Nubix to provide customer data from DSOs to suppliers switching. This allows suppliers to obtain the metering point ID which is required in order to perform supplier switching. Otherwise, all communication is bilateral between suppliers and DSOs. It is generally expected that the market as a minimum will need a communication hub for exchange of metering data when smart metering is in place by 2017.

In January 2012, NVE gave Statnett, the Norwegian TSO, the assignment of analysing and developing common ICT solutions for the Norwegian electricity market for end users. The purpose of common ICT is to ensure efficient use of smart metering rolled out by 2017 and facilitate future market development for the electricity market. Statnett recently concluded their cost-benefit analysis (CBA) on common ICT solutions. The solutions shall be able to support combined billing performed by suppliers according to NordREG recommendation from December 2011.



Source: Statnett (2012)

Figure 2.11: Norway - Central metering data management

Two general models have been considered: 1) a data hub model with central data storage and management, and 2) a decentralised model where a common communications hub routes access to all DSOs' meter databases. The former model entails that several tasks are transferred from DSOs to the central data management system, including customer oriented processes like supplier switching, moving and possibly billing of network charges.

2.6.3. Rationale for using a centralised model

The CBA results in a strong recommendation for a central data hub, with estimated net savings between 212 and 424 MNOK. Net savings of the communications hub was estimated to be between -84 and 96 MNOK.

In addition to cost efficiency, the preferred model is deemed qualitatively superior to the communications hub. The data hub model is deemed better or much better than the communication hub model on the following issues:

- Data quality and efficient distribution of meter values
- Supports the supplier centric market model
- Facilitates additional services through smart metering
- Efficient organisation and management of common ICT solutions
- Robustness in regard to international integration
- Cost efficiency

Based on the CBA, NVE will decide on which model to pursue and give guidance to several issues related to organisation and development of the data hub. In general, stakeholders have been positive towards the CBA and its recommendations.

2.6.4. Customers

Who owns and controls data

According to regulations taking effect by 2017, metering data shall be registered and stored by the DSO who is the meter operator in Norway. If a data hub is implemented, it will probably inherit some of the requirements currently applied to the DSO. However, the DSO will still be responsible for metering systems and for the final quality of metering data. A data hub may not take this responsibility, but could provide quality assurance services to improve the process of data management.

Information provided to customers

The regulation stipulates that meter values from the previous day shall be available for customers and suppliers by 09:00 the next day. Hourly data shall be stored for 15 months, while weekly and yearly values shall be stored for 3 years.

Third parties with customer approval may also get access to metering data, implying that the customer is the owner of the data.

Benefits to customers

With common ICT solutions it will be possible to require a high level of data security. Privacy concerns could be alleviated by allowing that customers to monitor their data that is in the data hub and who gets access to the data. It could also provide an opportunity to let customers decide if they accept more data being stored than the minimum requirement if they prefer so.

According to the metering regulation, DSOs shall provide information on consumption, prices, tariffs and total costs on the internet. This task would probably be handed to the data hub. Provisions for billing information will be amended at a later stage. NVE is planning an information campaign leading up to the main roll-out of smart meters where customers will be informed of the benefits of smart metering and possibly of common ICT solutions.

2.7. Spain

2.7.1. Market overview

Spain has fairly developed electricity and gas markets, fully opened to competition since 1 January 2003, with household customers having the right to opt for regulated end-user prices. In both markets, and especially in electricity, a high proportion of retail supply and distribution activities are carried out by vertically integrated groups.

Regarding the electricity retail market, the final demand was 244TWh and there were 27 million customers in 2010. The market structure is characterised by the presence of more than 300 DSOs and more than 100 active suppliers. A relatively high degree of concentration exists: there are three main companies responsible for serving more than 90% of distributed energy and more than 80% of retail supply. Nonetheless, it must be stressed that legal and functional unbundling is fully implemented between distribution and supply activities. In terms of market dynamics, there is a historic high degree of customers remaining with the supplier affiliated with the DSO of their area (about 72%), but this is showing a decreasing trend, while the switching rate, around 7% in 2010 and above 10% in 2011, is increasing (most switches still are referring to customers moving from a supplier of last resort, with a regulated tariff, to a supplier in the free market).

Regarding the gas retail market, the final demand was 401TWh in 2010 and there were more than 7 million customers in 2010. The market structure is characterised by six DSOs and more than 60 active suppliers. The degree of concentration is also relatively high, with one main company accounting for nearly 70% of distribution and 37% of retail supply. As in electricity, legal and functional unbundling between distribution and supply activities is in place. A similar trend is also observed in relation to market dynamics: the percentage of customers remaining with the supplier affiliated with the DSO of their area (70% in 2010) is decreasing, while the switching rate (12% in 2010 and 20% in 2011) is on a growing trend (most switches are taking place between suppliers in the free market).

The existing structure of gas and electricity markets can shed some light on the different features of meter value management, and information exchange in general, between suppliers and DSOs, as explained below.

2.7.2. The data management model

Stakeholders' roles

In both gas and electricity the retail market design is de facto a supplier centric model; namely, there is one single contract between the customer and the supplier, with the latter acting as the main point of contact with the customer for most business processes such as switching, billing, activation, deactivation, etc. On the other hand, DSOs do not have direct contact with the customer, except for connections, disconnections and interventions on customers' installations. DSOs operate and maintain the networks, grant access under a regulated third party access (TPA) regime and perform meter reads. Also, in order to make all business processes related with the decisions of consumers and suppliers possible, DSOs maintain an intense information exchange with suppliers.

Storage and information management model

The solution adopted so far in Spain for the information exchange between suppliers and DSOs is a decentralised one, partly as a result of the relatively highly concentrated structure of the distribution market.

Both in the gas and electricity markets the model for exchanging information between the metering operators (the DSOs) and the suppliers is decentralised in the sense that there is a direct and bilateral exchange of information among all market participants, that directly send messages to everyone else.

Moreover, there is no centralised storage for the exchanged data; all data is stored by each distribution company in its own data base.

For the most common processes, such as switching, DSOs and suppliers have voluntarily agreed on detailed standard information flows and messages (these are currently used, permanently updated and published in the web page of the switching office, OCSUM). Thus, such processes are not mandatory through regulation, although there are basic legally binding rules concerning time frames (e.g. time period for DSOs to execute a switch request) and concerning the main responsibilities of suppliers and DSOs (e.g. suppliers have to communicate the termination of a contract within a given time period). The regulation of these processes is currently being studied.

This standardisation does not affect, however, new connections or the meter data information for billing purposes.

In the electricity sector each distribution company has developed and has paid for its own database and IT information exchange system, implying that all suppliers must use different interfaces when communicating with the different DSOs.

As for gas, all distributors and suppliers use the same software (interface) which has been developed and paid for by all DSOs.

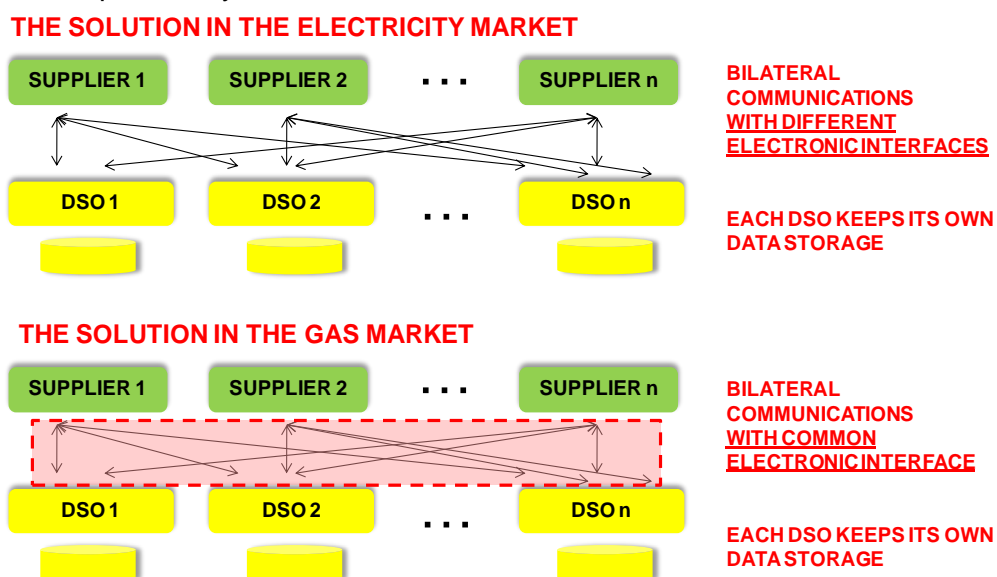


Figure 2.12: Spain - The MDM solution in the electricity and gas market

Relevant regulation

The current Spanish regulation, as established in Royal Decree 1011/2009, imposes on each distributor an obligation to maintain a database of all the supply points (grid connection points) situated in their area, called SIPS (*Sistema de Información de Puntos de Suministro*).

Under this regulation, all registered suppliers are entitled to unconditional and free access to the data included in the SIPS. To this end, it is legally mandatory for DSOs and suppliers to develop the necessary information technology system to allow for: (1) online consultation, without limits, of the data base and (2) reception and validation of switching requests and other information exchanges among suppliers and DSOs.

It is worth mentioning that there have been a number of national competition authority (CNC) decisions on this issue. Until 2007, regulation concerning access to supply point information was not well defined and distribution companies denied new entrants (independent suppliers, such a Centrica) access to information on supply points or subjected it to conditions (e.g. DSOs were asking for the supply point identification number as a pre-requisite). This refusal to grant access to SIPS, as well as the discrimination in favour of their own supplier business which had free access to the data, was declared by the CNC an abuse of dominant position contrary to competition law.

Partly as a result of these cases, regulation became stricter and clearer in relation with access to SIPS. This is perceived not only as an important tool to foster competition, but also as an issue that demands a regulatory approach, given the potential ability of the vertically integrated undertaking to use this information in a discriminatory way.

The content of the SIPS is very comprehensive. It includes all technical information concerning each supply point (identification number, location, connection date, access tariff, voltage level, etc.) but also identification data of the owner and very relevant commercial data, such as the monthly electricity/natural gas consumption over the previous two calendar years.

DETAILED CONTENT OF THE SIPS FOR ELECTRICITY DSOs

According to Royal Decree 1011/2009, DSOs must have a complete and updated data base which includes all grid connection points (supply point databases) which are connected to their networks and to the transport networks within their area. This data base shall at least include the following data:

- a) Universal Point of Supply Code (CUPS)
- b) Distribution company
- c) Exact location of supply point
- d) Date of start of supply (date, month and year of the supply point connection to the grid)
- e) Tariff in force for supply or access (according to governing regulation denomination)
- f) Voltage of supply (in volts) of the connection of the supply point to grid
- g) Maximum authorised power per bulletin of the authorised installer
- h) Maximum authorised power per deed of authorisation for commissioning

- i) Type of supply point according to classification “name of types of measurement points” defined in the relevant regulations
- j) Availability of power control switch
- k) Type of consumption profile according to regulatory standards
- l) Value of the recognised rights of extension for the supply point
- m) Ownership of measure equipment
- n) Ownership of power control switch
- o) Value of supply point recognised access rights
- p) Contracted power per each period (value of the contracted power depending on tariff contracted: basic tariff/TPA tariff)
- q) Date of last tariff contracting movement (last change of parameters in respect of tariff itself, contracted power, voltage of the connection, supplement for hourly variable tariff discrimination and the invoicing mode)
- r) Date of last change of supplier
- s) Deadline for recognised extension rights
- t) Consumption over the last two calendar years (by hourly variable tariff discrimination periods and months). Monthly frequency (except for supply points with bi-monthly reading), broken down into the periods which the measure equipment records at source. For the last two calendar years counting from the date of enquiry includes: consumption of active energy, consumption of reactive energy and Power drawn.
- u) Date of last reading
- v) Non-payment data
- w) Guarantee deposit
- x) Point of supply owner information (natural or legal person)
- y) Name and address of owner of point of supply
- z) Use of the point of supply of a natural person

Royal Decree 1011/2009 also establishes a similar minimum content for the gas SIPS.

No rules are included in this regulation regarding the time frame and the exact format that DSOs have to comply with in order to provide the data that suppliers may request.

Supervision and enforcement of regulation

Royal Decree 1011/2009 created a switching office, OCSUM, as a privately owned company, with DSOs and suppliers as its shareholders¹², with the following main duties:

- Monitoring of switching in order to ensure that it takes place on transparent, objective and independent grounds.
- Promotion and monitoring of the exchange of information among suppliers and DSOs
- Proposals to improve operational procedures and regulations relevant for switching
- Verification that customers are giving their consent to switching

¹²OCSUM is a non-profit company, whose creation was established by law in 2007, with the specific mandate to monitor switching processes and related issues (e.g. communications between suppliers and DSOs). OCSUM's shareholders are gas and electricity retailers, accounting for 70% of the capital, and gas and electricity DSOs, accounting for 30% of the capital. All retailers and DSOs have the legal obligation to be OCSUM's shareholders.

OCSUM has free access to the supply point database and it is entitled to ask DSOs and suppliers for all the information required to ensure the compliance with the established switching processes.

By law, the CNE is in charge of supervising companies' compliance with regulations related to switching. Moreover, the CNE resolves disputes on the type and content of the information to be exchanged between suppliers, distributors and OCSUM.

However, the enforcement of existing regulation on the information exchange processes regulation is somewhat hampered by the fact that the CNE lacks direct access to the DSOs database and OCSUM has no strong incentives to be proactive in carrying out its duties.

Under Spanish law it is considered a serious breach of law if electricity distributors or suppliers fail to comply with their obligations to allow access, maintain a data base of all points of supply connected to their networks, implement the required IT systems and receive and check information from requests and communications with customers and electricity suppliers. Any unjustified failures to comply with the deadlines for communications with suppliers and consumers and for carrying out switching requests is considered a minor breach of law, although it may amount to a serious offence if it is repeated over time. There are no similar specific provisions for gas switching breaches, although regulatory proposals are under way to ensure an equal treatment for both sectors.

2.7.3. Customers

Consumers have free access to their consumption data contained in the SIPS and may forbid, in writing to DSOs, to make their data accessible to suppliers. The consumer request must be registered in the DSO data base and the switching office, OCSUM, must keep a copy of it.

Notwithstanding the above, if the consumer is defaulting on his/her electricity or gas bills, he/she cannot prevent his/her identification number and default situation from being revealed.

Suppliers who make use of the information appearing in the SIPS have the obligation to treat it confidentially.

In December 2010, the Spanish Highest Court of Appeal declared the regulation contained in Royal Decree 1011/2009 concerning the exchange of private data compatible with private data protection rules due to its necessity and proportionality to the aim of securing the right of consumers to switch supplier.

2.7.4. Rationale for using a centralised or decentralised communications model

Advantages and disadvantages of the existing model

The existing model in Spain is a combination of a decentralised solution and mandatory regulation on meter point data access. Its advantages and disadvantages can be analysed in terms of four key aspects: proportionality, cost efficiency, governance and transparency.

Proportionality

Within the Spanish context, the bilateral decentralised model, accompanied by mandatory rules, has implied the development of the internal data base that distributors already used. It has allowed access to the required data and the exchange of information necessary for switching and other business processes. In this sense, it seems a less “intense” and less intrusive regulatory measure than establishing a new central hub model.

Cost efficiency

The move from the existing decentralised model to a central data hub (for information exchange and/or for data storage) is regarded by existing DSOs as very expensive and possibly not very cost efficient, especially due to the costs and efforts to adapt IT systems. However, once in place, a central hub could be potentially more cost effective as it will allow sending and receiving messages to only one address. In Spain no cost-benefit analysis has yet been carried out regarding a possible transition from a decentralised model to a centralised hub.

Governance

In the bilateral model there is clear proprietor of data base and IT system. Each DSO is responsible for developing the data base and paying for the IT system that it owns (although in the case of gas there has been a joint development of common software). In a data hub system, regulation has to be established regarding the ownership/control of the data hub and how to finance it, which could be more complex. Current regulation in Spain would require a substantial change in order to move to an independent central information exchange hub model.

Transparency

The most important flaw of the decentralised model is its lack of transparency and potential room for discriminatory behaviour by DSOs, especially when they are vertically integrated with suppliers. The Spanish case shows that a very detailed regulation is needed in order to ensure that DSOs do not discriminate or make access to data more difficult for suppliers that are not affiliated to the same group. In relation with this aspect, there seems to be room for improvement and the CNE has launched proposals to improve the access to SIPS and to transform the switching procedures (that are now just agreed by companies) into public and homogeneous formats that will be incorporated in detailed regulations.

As regards consumer data privacy and security, it seems clear that both centralised and decentralised models will have to comply with the same rules.

Possible drivers towards a centralised solution

So far, competition developments have been the most important drivers towards enhancing free and unconditional access to the DSOs data base and regulation has focused on standardisation and transparency of processes. No obvious need/demand has emerged so far to introduce a central hub managed by an independent agent.

However, looking towards the future, it is possible that the existing model may become obsolete soon: with the introduction of smart grids and demand response mechanisms, pressure may arise from new entrants and consumers to get access to more information in a more flexible way. This new situation could put some stress on the amount and nature of regulation that is necessary to make the decentralised model work.

Throughout 2012 the CNE has been leading a working group on smart grids, with the participation of several market agents, mainly DSOs. Among the different issues and proposals that are stemming from this group, a proposal has been put forward to improve the information and services that DSOs are providing to the rest of actors (mainly suppliers and customers). Making information available to all agents has been identified as a key goal to achieve. At present this is not seen in contradiction with the existing de-centralised approach. Nevertheless, we cannot exclude that drivers for a change towards a centralised solution may arise in the future smart world.

2.8. The Netherlands

2.8.1. Market overview

Since 1 July 2004, the energy market for residential customers and small businesses ('small consumers') has been fully liberalised. In addition to the phased liberalisation of large consumers at an earlier stage, as of 1 July 2004 small consumers are also able to choose their own supplier of gas and or electricity. From this date the supply tariffs are no longer regulated, although NMa assesses the fairness of supply tariffs. The liberalisation of the small consumer market requires extra awareness of the interests of the small consumer.

The structure of the Dutch retail market is characterised by three very large suppliers (all incumbents), four relatively small suppliers and a large number of very small suppliers. The three very large suppliers that supply gas to small consumers have a market share that is close to 80%. All of these are incumbents. Of the four relatively smaller suppliers, one is an incumbent and three are new entrants who entered the market after full liberalisation in July 2004. On 1 January 2011, there were a total of 31 energy suppliers in the possession of a gas supply licence (not all of these are independent).

There is no vertical integration of supply (to small consumers) and gas production. The biggest gas producer in the Netherlands does not sell directly to the small-consumer market. Vertical integration of the grid companies and supply companies amounts to 25,3%, expressed as market shares of the small consumer market for gas. The rest of the market is supplied by either independent entrants or formerly integrated companies that have fully unbundled.

Between 1 January 2011 and 31 December 2011 9.7% of all consumers switched electricity and 9,8% switched gas supplier. This is a slight increase from the previous 12 month-period (8,8% electricity and 8,9% gas). The procedure for switching is as follows. If gas consumers wish to switch their supplier, they must inform the new supplier verbally (for instance, by telephone) or in writing and must then authorise this new supplier to request the necessary information and take the necessary action (for instance, requesting information from the connection register of the grid operator and making arrangements in relation to programme management). A consumer can also authorise an intermediate, such as a price comparison website to inform the new supplier on his behalf. In addition to this, the new supplier has to ask the consumer for their meter readings. If they fail to do so, or if the meter readings are incorrect, the final settlement by the former supplier will be based on an estimate of consumption. The new supplier submits a request for a switch to the grid operator. The meter reading accompanying the switch has to be sent to the grid operator as soon as possible by the new supplier, but at the latest 15 working days after the date of the switch. Immediately after receiving the request for a switch, the grid operator carries out a number of checks (for instance, whether the application was submitted at least five days before the intended date of the switch). If the result of the checks is positive, the grid operator confirms acceptance of the switch at the latest on the working day after receipt of the notification of the switch from the former and the intended new supplier. At that moment, the grid operator also enters the change into the connection register. The grid operator passes on the meter reading(s) as soon as possible, but at the latest on the 30th working day after the date of the switch, to both the former and the new supplier. The grid operator also notifies the former supplier of the consumption so that the former supplier can draw up the final invoice.

Both the transmission tariffs and metering tariffs are regulated (meter rental). Supply tariffs are not regulated (but there is a form of ex-post tariff “supervision”).

The majority of consumers perceive the price of energy to be high or very high. At the same time they expect to gain less from a switch than they actually can. In 2011 consumers expected to gain a maximum of €59 on a yearly basis by switching supplier. In reality the maximum price spread was €464 for an undetermined contract with a floating tariff.

Consumers tend to be very loyal to their own supplier. They rate the level of service of their own energy supplier as very high, but seem to distrust the energy sector as a whole. This in itself is a major hurdle for many consumers to actually perform a switch. Those who do switch tend to switch again. Up to now almost 35% of all consumers have switched supplier. Of those who did not switch supplier, 25% have renegotiated their contract with their own supplier.

2.8.2. The data management model

Introduction

From 1 January 2012 the roll out of smart meters has started according to the revised and amended Dutch Electricity and Gas Acts. The DSO (regional grid operator) is mandated to offer smart meters to consumers and most SME's ('small end users'). For 2012 and for 2013 this offer is only mandatory for a limited number of situations, such as on request of the consumer or in case of a significant energy saving renovation. It is expected that the DSO will get the task to offer all consumers a smart meter from 2014 by law.

The roll-out of smart meters is part of a broader transition to a new market model that should result in improved services for consumers. Part of this new market model is that the metering responsibility will move from the DSO to the supplier in 2013. The supplier will also be solely responsible for billing (also for transportation costs that the supplier will transfer to the DSO) as per 2013.

There are four different gateways (P1 - P4) to retrieve metering data:

- The P1 gate, or the 'customer-gate' can be used by customers to retrieve metering data directly from the meter by himself. These local metering data can be transferred to, for instance, an inhome display or home energy management app.
- The P2 gate can be used to connect other smart meters that don't have the possibility to communicate externally (outside the home), such as a production meter of solar panels or a water meter.
- The P3 gate is used for the external communication with the central server at the DSO.
- The P4 gate can be used by the supplier or independent service provider to retrieve metering data remotely.

The P1 gate produces a continuous flow of metering data. The P4 can be read once every 24 hours for 15 minute readings E and hour readings G.

Description of market model & data model¹³

The market model for the Netherlands has the following market roles that are relevant for data management:

- a. The DSO, regional grid operator of which there are eight in total, is the owner of the meter and meter system. The DSO installs and maintains the meter and is responsible for retrieving the raw metering data remotely via the P3-gate. The DSO will make metering data available for metering companies at the P4-gate, which can be considered as a demand driven gate. This means that a metering company will request for data at P4 followed by a meter reading by the DSO.
- b. The supplier is responsible for all customer communications, services and billing. A supplier takes the initiative to request for metering data via a metering company via the P4-gate. In practise most metering companies are part of the supplier or have strong links with the supplier.
- c. The 'Onafhankelijke Diensten Aanbieder' ('ODA') is an undefined market role in the free market domain that is expected to offer energy data services to consumers via P4 or via P1. There is no definition of these independent service providers in regulation as this a completely free market. Expectations are that new ODAs will appear in the Dutch market with new services. It is expected that most services will be based on P1 as the frequency of metering data at that gate is near real time (which makes sophisticated home energy management possible).
- d. The consumer is the user of the metering data and services. A consumer has the option to use an ODA or the energy supplier for services. A consumer also has the choice to use P1 or P4-gate for retrieving metering data from the meter to the service. In practise is not expected that this P1 or P4 choice will be an explicit choice.

2.8.3. Customers

Model built on consumer freedom of choice

After strong discussions in parliament about privacy issues the Dutch data management model has been totally revised. The current model has been approved by parliament and is supported not only by the energy companies, but also by consumer organisations and a wide range of other stakeholders. The essential element of the Dutch data management model is freedom of choice for the consumer. The design for this is described below.

1. A relatively privacy incentivised default amount of meter readings for the passive consumer.

¹³ The data management model as described has been implemented into legislation (01-01-2012), but is in practice applicable for those situations where smart meters have been installed.

A consumer that accepts a smart meter, but does not undertake any action after installation of the smart meter does not need to fear that personally sensitive information will be retrieved by the supplier (or by a third party). The Dutch Electricity and Gas Law had defined a relatively limited amount of meter reading that can be executed by the supplier. Only 1) in case of an event like switching or moving, 2) for the yearly bill and 3) six times a year for a so called cost and usage indication overview the meter is allowed to be read by the supplier (via P4). Explicit permission is needed for a more comprehensive meter reading frequency.

2. A consumer has the right to refuse a meter or to accept but switch it off.

The DSO has a mandatory task in offering smart meters to consumers who have the right to accept the meter or to refuse without any further notice. It is also possible to accept the smart meter and to turn it 'administratively off', which means that the smart meter will behave as an analogue meter as long as it keeps this status. Such a meter cannot be used for remote meter reading (only a limited list of non user related technical data can be retrieved by the DSO remotely). A meter that is 'administratively off' can also not be disconnected remotely.

3. Any service the consumer needs or wants to use.

A consumer can use home energy services offered via his energy supplier. A consumer can also choose for not using his supplier for such services, but use an ODA instead. Both supplier and ODA are able –after explicit permission by the consumer- to retrieve the data via P1 or via P4. As the P1 is able to provide near real time metering data, where the P4 can only be read once every 24 hours for 15-minute readings for electricity and hourly readings for gas, the expectations are that P1 will be the dominant gate in future for services that need high frequency meter readings.

2.8.4. Rationale for using a centralised or decentralised communications model

In The Netherlands the choice was made for a 'hybrid' communications model. This model includes decentralised data storage and a central access server.

The chosen model is driven by the freedom of choice by the customer. Taking this principle into account, metering data has to be stored as 'close' as possible to the customer. This implicates a decentralised model, in which the storage of metering data takes place in the meter itself.

If the customer has given his consent to share his data, suppliers and/or ODAs should have access to the metering data without having to comply with different data standards and methods. A centralised communication hub, or a central access server, meets the need for one standard.

2.9. United Kingdom.¹⁴

2.9.1. Market overview

Regulatory regime

The Gas and Electricity Markets Authority (GEMA) exercises regulatory functions and duties in relation to the gas and electricity generation, transmission, connection, distribution and supply markets. However, the regulator is commonly known as Ofgem (The Office of the Gas and Electricity Markets) which is the collective term given to the civil servants employed by GEMA. We therefore use the term Ofgem throughout this case study to refer to the regulator.

Protecting consumers is Ofgem's first priority. They do this by promoting competition, wherever appropriate, and regulating the monopoly companies which run the gas and electricity networks. The interests of gas and electricity consumers are their interests taken as a whole, including their interests in the reduction of greenhouse gases and in the security of the supply of gas and electricity to them. Ofgem also acts as the competition authority for the energy sector in Great Britain. Their powers and responsibilities are set out in UK primary legislation: the Gas Act 1986, the Electricity Act 1989, the Utilities Act 2000, the Energy Acts 2008, 2010, 2011, the Competition Act 1998 and the Enterprise Act 2002; as well as in relevant European legislation.

The main, sector-specific, means of regulating the energy industry is through a licensing regime, supported by wider powers in primary legislation. With some small exceptions, any company supplying, generating, distributing or transporting gas or electricity within GB must hold a licence provided by Ofgem. The licences set out the conditions under which these companies can operate in the market.

The licences in turn require the establishment of a number of industry codes that underpin the gas and electricity markets. Licensees must sign up to and comply with these industry codes, as appropriate to the licence, in order to operate in the gas and electricity markets. These codes set out detailed contractual rules for industry that govern market operation and the terms for connection and access to energy networks. They typically contain more technical detail than the associated licences. For example, the Connection and Use of System Code¹⁵ constitutes the contractual framework for connection to, and use of, National Grid's high voltage transmission system. The codes are 'live' documents, meaning that they are regularly updated. While industry self-governance of codes may be allowed in some specific circumstances, some codes or sub-sections of codes may only be altered with Ofgem's consent.

¹⁴The approach described in this document relates to Great Britain (England, Scotland and Wales). Northern Ireland has separate arrangements established by its own regulator, Northern Ireland Authority for Utility Regulation.

¹⁵<http://www.nationalgrid.com/uk/Electricity/Codes/systemcode/>

Ofgem monitors companies' compliance with licence conditions, and can take enforcement action where appropriate. The Gas and Electricity Acts provide for penalties of up to 10 per cent of the turnover of the licence holder for failing to comply with relevant conditions. The Gas and Electricity Acts also provide for enforcement orders to be made to ensure that companies comply with their obligations.

Introduction to gas and electricity markets

Retail market

The retail markets in GB for electricity and gas encompass over 30 million households and businesses and over 50 million gas and electricity meters. The retail markets are fully open to competition in both electricity and gas. Competition was introduced in phases, starting in 1986 and being completed for all consumers in 2002. Since then consumers have been able to choose their gas and electricity supplier. During 2011, 15 per cent and 15.5 per cent of domestic consumers reported switching their gas and electricity supplier respectively.

In the domestic market, six large suppliers selling both gas and electricity between them supply over 99 per cent of GB domestic customers¹⁶. Dual fuel offerings, where customers receive both electricity and gas from the same supplier, and can receive a discount for doing so, are increasingly popular. In contrast, in the non-domestic market the six largest suppliers hold 90 per cent of the customer base and provide 85 per cent of the electricity supply, but only 30 per cent of the gas supply, with several other dominant suppliers active. Many of the supply contracts are specifically tailored to the business and some suppliers only supply either gas or electricity. Non-domestic customers range from small and medium enterprises up to very large industrial and commercial customers.

Metering market

Historically, network companies provided and maintained all domestic meters as part of their regulated monopoly businesses. Since 2000 Ofgem has taken measures to facilitate competition in gas and electricity metering services. Even though the network companies didn't have a legal monopoly on metering, Ofgem identified a number of barriers to the development of metering competition. The key issue was that even though a supplier could seek an alternative provider for a meter, they wouldn't experience a reduction in the charges they pay the network company.

Since 2000 Ofgem has taken measures to facilitate competition in gas and electricity metering services. Importantly, it set separate price controls on the gas and electricity metering activities of incumbent network companies in April 2002 and April 2005 respectively. This ensured that if a supplier used an alternative provider for a meter, their network company charges would be lower (by the amount set in the price control).

¹⁶[Retail Market Review](#), Ofgem, March 2011.

Metering competition is more developed in electricity where price controls on network companies with respect to metering services were removed in 2007. In the electricity market, suppliers often contract out metering services to third parties, such as meter operators. Price controls remain in gas, where network companies retain a large share of the metering stock and third party involvement with metering is less common.

The introduction of competition into metering services separated the roles and responsibilities of parties operating in the market. Suppliers are now at the centre of metering arrangements, and have primary responsibility for meter provision and maintenance¹⁷. This is known as the ‘supplier hub’ principle. Therefore, customers primarily interact with their suppliers with regards to the provision of metering services. In comparison, network companies have little contact with the customer regarding metering, although they do retain some metering responsibilities following emergency callouts. Therefore, unlike most other jurisdictions where metering services are provided by a single body which is often the network operator, metering services may be provided by the supplier, network operator or an unlicensed approved third party.

Gas and electricity networks

In both gas and electricity, for regulatory purposes the network is split into transmission (high pressure/voltage for gas/electricity respectively) and distribution (low pressure/voltage for gas/electricity respectively). Table 2.1 below sets out the number of transmission and distribution owners in gas and electricity.

	Transmission owners (TOs)	Distribution network operators (DNOs)
Electricity	3 onshore TOs ¹⁸ 5 offshore TOs	14 DNOs 4 independent DNOs
Gas	1 TO	8 DNOs 14 independent gas transporters

Table 2.1: UK - Number of network owners

¹⁷ In both gas and electricity, suppliers contract with Meter Asset Providers (MAPs), who fund the meter and its installation and receive a rent over the lifetime of the assets to cover these costs. Suppliers also contract with parties that take on responsibility for the installation and ongoing maintenance of the meters. In electricity, these are referred to as Meter Operators (MOPs) and in gas they are Meter Asset Managers (MAMs) (collectively referred to as “Meter Operators” in this document).

¹⁸ Three onshore transmission licensees in Great Britain, plus one electricity transmission business in Northern Ireland. This excludes interconnectors and offshore transmission

Unbundling

On 10 November 2011 the Electricity and Gas (Internal Markets) Regulations 2011 (“the GB Regulations”) came into force. The GB Regulations include the requirement for Transmission System Operators¹⁹ (“TSOs”) to be certified as complying with the requirements of the 3rd Package (including ensuring that TSOs are effectively unbundled, or separated, from generation, production and supply interests). The GB Regulations have designated the Authority as the National Regulatory Authority for GB and have given it the responsibility for administering the certification process for current and future GB TSOs.

2.9.2. The data management model

Introduction

This section looks at the roles of various stakeholders during and after the roll out of smart meters. The history of the GB market was covered in the previous section. Figure 2.13, below, illustrates the key features of the GB smart meter solution as set out by government in March 2011²⁰ (“March 2011 Response”). The equipment in customers’ premises will include:

- gas and electricity smart meters;
- an In-Home Display (IHD) (for domestic customers only) which provides information on a customer’s energy consumption;
- a Wide Area Network (WAN) to provide two-way communication between smart meters and Data Communications Company (DCC);
- a Home Area Network (HAN) to link the gas and electricity smart meters, IHD, the WAN module and other smart devices within the consumer’s premises.

¹⁹ This includes electricity transmission owners (both onshore and offshore), gas transportation and electricity and gas interconnector licensees.

²⁰ [Smart Metering Implementation Programme: Response to Prospectus Consultation](#), Ofgem/government, March 2011

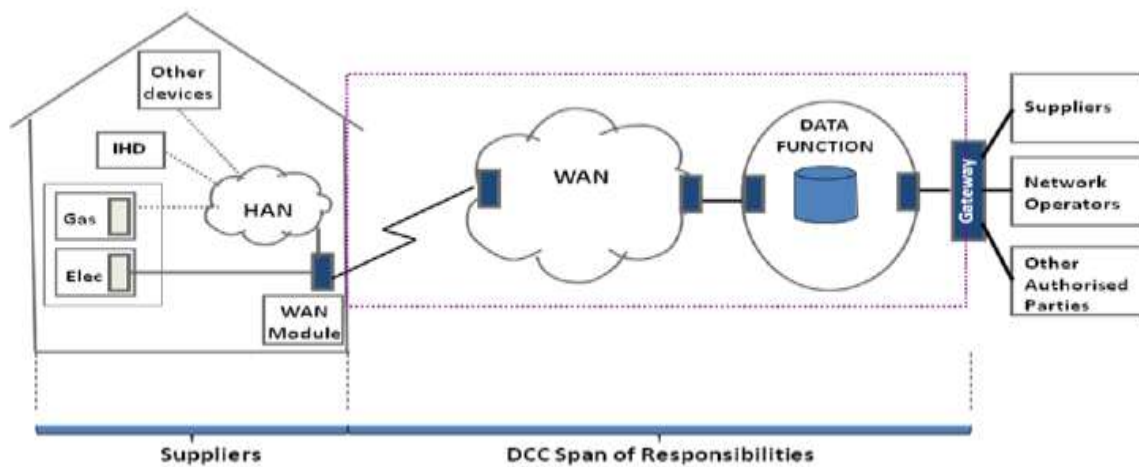


Figure 2.13: UK - The high-level design of the end-to-end smart metering system as set out in the March 2011 Response

Before reading on, it is important to note that various aspects of the detailed design of the policy in relation to the smart meter roll out are still to be finalised by government. This paper describes the current situation at a high level; the details may change as a result of ongoing work.

Key stakeholders and their roles

Consumers

The meters will be capable of storing 13 months of half hourly consumption reads. The consumer will control who can access the smart meter consumption data and at what level of granularity (exceptions to this discussed below). Below we describe the ways in which the consumer can share their data.

Data Communications Company (DCC)

A key government decision was that energy suppliers will be responsible for rolling out meters (i.e. purchasing and installing). However, data communications will be coordinated centrally, through a new regulated entity, DCC. Government noted that this “offers the best model for Britain’s smart meter roll out. In particular, the Central Communications Model combines strong incentives for energy suppliers to deliver a high quality service to their customers, with wide scope to simplify and improve industry processes making it easier to switch between suppliers.”

Under this model, if a supplier, network operator or third party wishes to access consumer smart meter data they will have two options:

- The consumer can provide direct access to the data (e.g. they may extract the data from the meter to a device (e.g. a USB) and then the consumer may be able to send that data via email); or

- The DCC can, on request from an appropriately authorised party (e.g. one that has appropriate consent or other rights to the data), extract the meter data and provide it to that party²¹. In this sense, DCC acts as a gatekeeper on behalf of consumers.

In reality, DCC will be a “thin” company. Data²² and communications²³ services will be provided by service providers, with DCC managing these contracts. Government is procuring the initial contracts for the service providers, and these will be handed over to DCC, once it is appointed. For simplicity, where we refer to DCC, this can include both the licensed DCC and the service providers whose contracts DCC will manage.

Service provider procurement

DCC will be a licensed entity responsible for the procurement and contract management of the service providers providing these data and communications services. DCC will be required to be independent from its providers of data and communications services.

The licence tendering of DCC will be conducted in parallel to the procurement of its service providers, who will be appointed through open competition in a procurement process managed by government. The communications services will be split into three geographically based regions and the tender requirements will be technology neutral. There will be only one data services provider for all three regions. Key procurement objectives include to:

- deliver a functional and secure end-to-end technical solution for smart metering data and communication services that is effective, efficient, economical, and coordinated at the outset and over time;
- accommodate, at a cost not likely to be disproportionate to any associated benefit, flexibility to adapt to changing requirements over time, including where such changes are required as a result of an amendment to the applicable regulatory framework;
- adopt, where relevant, best industry practice approaches to the procurement and management of its service provider contracts; and
- provide for the continuity of service in the event of financial or operational failure of, or on the expiry or early termination of, the DCC licence or its service provider contracts.

Government

Government is designing and putting in place a new regulatory framework to appoint competitively a commercially viable and operationally effective DCC. The DCC and the parties that it provides services to will be subject to appropriate regulatory controls through five separate regulatory interventions:

²¹ The DCC will have no interface with the consumer

²² Data service provider – Providers of any data service to DCC, including data retrieval, aggregation and processing

²³ Communications service providers – Providers of services to DCC which will be used by DCC to provide services to persons wishing to send data to and from smart meters

- the DCC Prohibition Order – to establish the requirement for DCC to be regulated;
- the DCC Licence – to place obligations and restrictions on the DCC’s conduct;
- the DCC Licence Application Regulations – the process for the competition for the award of the DCC licences;
- a range of new conditions in existing licences and changes to existing codes; and
- the Smart Energy Code (SEC)²⁴ – to establish the operational arrangements for DCC.

Ofgem

DCC will be regulated by Ofgem in a similar way as network companies are. For example, DCC’s licence will set out various obligations and rights. Ofgem will regulate DCC through a mixture of regulatory tools, such as our monitoring and enforcement powers and licence modification powers. DCC, suppliers and distribution companies will be required to accede to and comply with the SEC. As such, a failure to comply with the SEC will be a failure to comply with the licence. Ofgem would be responsible for approving certain changes to the SEC, similar to other industry codes where Ofgem has regulatory oversight.

As noted, the initial DCC will be appointed through a competitive tender process run by government. The DCC licence will have a fixed term with the ability for Ofgem to extend this for a further period. Ofgem will conduct future tenders to appoint another (or the same) DCC prior to expiry of the incumbent DCC’s licence.

Suppliers

The supplier will pay for and has an obligation to install smart meters (although the installation can be contracted out). The costs of installation (as well as the cost benefits) are likely to be passed through to consumer bills. The maintenance of meters will also be the responsibility of the supplier (although in reality this responsibility is usually subcontracted to Meter Operators).

Government propose that suppliers will be able to access certain smart meter data to fulfil regulated duties. This is unlikely to include half-hourly consumption data. Access to data beyond the scope of that deemed necessary to fulfil regulated duties will require some form of consent from the consumer. Government are consulting on how Meter Operators (contracted by suppliers) should be able to access data (e.g. whether the supplier should pass on meter data or whether the meter operator can access it independently with the consumer’s permission).

²⁴ The SEC will be a new licence-backed industry code being created to underpin arrangements for the introduction and ongoing operation of smart metering. As a minimum, the SEC will set out arrangements between DCC and relevant parties, such as suppliers and network companies, in relation to the smart metering system data and communications services. It is expected that the Code will, over time, increase in scope to include other activities.

Network companies

Government propose that distribution network companies will be able to access certain smart meter data to fulfil regulated duties.

Components/description of model/services

The initial scope for DCC is that it will simply act as a conduit for passing the data from the meter to someone who requests data. Government are considering how to ensure that parties can only access data that they have a right to (e.g. third parties would only be allowed access to data that the consumer has consented to). In the early years you would expect the range of message sent to be relatively small, but to grow over time as more companies accede to the SEC and increase the services offered to consumers. Over time however DCC may take on more functions:

- DCC is proposed to take over central registration services, which facilitate the change of supplier process, for all gas and electricity supply points, including non-domestic consumers.
- DCC may provide data aggregation services (i.e. the process of aggregating individual customer data for the purposes of settlement).

DCC will not offer any services to consumers. It may provide “value added services” to other industries (i.e. non-energy related), provided these do not prejudice its ability to provide its energy related services.

There will be a regulatory framework governing whether and how new services might be offered by DCC. This will include arrangements to ensure that core customers of DCC obtain an appropriate share of the benefits derived from DCC service expansion.

2.9.3. Customers

Who owns and controls data

The UK government is currently consulting on data access and privacy proposals. Under the proposals, the consumer would have choice over who can access the smart meter consumption data and at what level of granularity. However, licensed suppliers and distribution companies would be able to take monthly consumption reads from their customers for billing or to fulfil regulated duties, without consumer consent.

On 5 April 2012 government published for consultation²⁵ their proposals on privacy and consumer consent. Their key proposals (in relation to parties receiving consumer data via DCC) are:

²⁵ Link to government consultation:

<http://www.decc.gov.uk/assets/decc/11/consultation/smart-metering-imp-prog/4933-data-access-privacy-con-doc-smart-meter.pdf>

Suppliers

The basic framework would be:

- Allow suppliers to read monthly (or less granular) consumption data, without customer consent, for billing and payment, and for the purposes of fulfilling any existing statutory requirement or licence obligation.
- Allow suppliers to read daily (or less granular) consumption data, with clear opportunity for the customer to opt out, for any purpose except sales and marketing.
- Require that suppliers must receive opt-in consent from their customers in order to read half-hourly consumption data, or to use consumption data for the purposes of sales and marketing.

The exceptions to the basic framework include:

- Allow ad hoc reads to be taken, without consent, where the supplier has reasonable suspicion that theft is being committed, or for the purposes of accurate billing (for example, at change of tenancy/change of supplier/change of tariff events) and addressing customer queries. The data accessed for these purposes must be no more granular than daily.
- Allow collection of half-hourly consumption data for use in approved trials, with clear opportunity for the consumer to opt out.

Distribution companies

Government is still considering the data access arrangements for distribution companies. In the 5 April 2012 consultation, government set out the view that distribution companies should be required to develop more detailed plans for how privacy concerns would be addressed and what the data would be used for, and submit these plans to government or Ofgem for approval.

In the meantime, before plans for access to more detailed data are approved, distribution companies would be able to access monthly consumption data with the same levels of consumer choice as is proposed for suppliers.

Third parties

Third parties include energy service companies and suppliers that are not the registered supplier for a particular premise. Third parties would require opt-in consumer consent to access any data via DCC.

Information provided to consumers

There are various ways that a consumer may be able to access information regarding their energy consumption:

- Consumers will have an IHD which may provide information such as:
 - Ambient display of real-time energy based on usage

- Current and historical electricity and gas consumption
- Display of account balances for credit customers
- Consumers may be able to access their energy consumption data over their HAN and transfer this information to other devices in the home via a “bridging device”
- Suppliers may be obliged to provide local access or provide the 13 month half hourly data by other means on request
- Under the Data Protection Act 1998 people have the right to obtain information held about them²⁶

Benefits for consumers

Government carried out an impact assessment²⁷ and estimated that over a 20 year period the total cost of the rollout programme will be £11.3 billion. The predicted benefits across the domestic and smaller non-domestic sectors were estimated at £18.6 billion. This implies a net benefit of £7.3 billion. These benefits derive in large part from reductions in energy consumption and cost savings in industry processes. The costs and subsequent benefits are expected to come through customers' energy bills. Other benefits for consumers include an end to estimated bills and less need for manual meter readings.

2.9.4. Rationale for using the centralised communications model

There are various features of the GB energy market that mean that creating a central communications company is the best solution for providing communications services. Key to this is that there is no single existing company that would naturally perform this function, for example:

- GB has competitive markets, with multiple suppliers;
- Further, there is competition in metering, so metering services are provided by multiple bodies (distribution companies, suppliers and third parties); and
- There are multiple distribution companies spread across GB, and customers do not have a direct relationship with network companies (see the earlier discussion of the “supplier hub” principle).

Below we outline the various advantages of having a centralised communications provider. Of note is that in a market with multiple suppliers and providers of meters, a centralised communications provider will protect consumers by delivering a high level of interoperability²⁸.

²⁶See section 7 of the Data Protection Act 1998: <http://www.legislation.gov.uk/ukpga/1998/29/section/7>

²⁷The impact assessments for both domestic and non domestic roll out are here: <http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=40&refer=e-serve/sm/Documentation>

²⁸ Interoperability is the ability for different components of the smart metering system to exchange data and work together independent of manufacturer. It is also the capability of systems or devices to provide and receive

Advantages

- *Cost efficiency:* Centralisation will provide substantial economies of scale in providing data and communications services;
- *Coverage of hard-to-reach premises:* Centralisation enables holistic communications solutions that maximise the opportunity for full rollout;
- *Efficient industry processes:* DCC has a great potential to build on its data management function to streamline and improve industry processes, including change of supplier processes;
- *Data security:* A centralised communication function makes it easier to ensure comprehensive and consistent end to end security arrangements;
- *Smart grids:* Centrally co-ordinated communications provide greater ability to enable the development of smart grid services over time, compared to the alternative of decentralised communication solutions; and
- *Extra-industry value-added services:* DCC will operate a GB-wide communications infrastructure. This can be leveraged to offer value-added services to other sectors, driving down the cost to the energy industry over time.

Challenges

- Creates a monopoly in an area where the market may have provided a communications solution. The negative effects of this could include:
 - More expensive provision of communication services;
 - As there is no competitive pressure on DCC to provide better services than their competitors, services may be less attuned to the needs of users;
 - Costs associated with establishing the regulatory framework for DCC and for running tender processes to appoint DCC and service providers.
- Having a single communications entity with a link to all meters means there is a single source for hackers to target (however, as noted above there are security benefits to having a single entity).

Delays in establishing the regulatory framework and appointing DCC could create uncertainty and delay the roll out of smart meters.

services and information between each other, and to use these services and information exchange to operate effectively together in predictable ways without significant user intervention. Within the context of the smart metering system, it means a seamless end-to-end system from equipment in a consumer's premises through to DCC, suppliers, network operators and other authorised parties.

3. Findings and conclusions

3.1. Market overview

The electricity and gas markets in the countries taking part in this report have substantial differences in the number of network companies, DSOs, and number of suppliers, as shown in tables below.

Country	TSOs	DSOs	Suppliers	Metering services ²⁹
Austria	2	128	144	DSO
Belgium	1	27	25	DSO
Denmark	1	75	54	DSO
Germany	4	866	1013	Metering Operators 866 DSOs as base meter operator, 20 independent from DSOs
Italy	1	144	381	DSO
Norway	1	157	100	DSO
Spain	1	300 ³⁰ +	100+	DSO
The Netherlands	1	8	30+	DSO
UK	7 3 onshore, 5 offshore	18	24	Supplier

Table 3.1: Electricity market overview of countries covered in this report

Country	TSOs	DSOs	Suppliers	Metering services ³¹
Austria	3	20	24	DSO
Belgium	1	18	19	DSO
Denmark	1	3	11	DSO
Germany	16	707	820	DSO
Italy	10 ³²	247	231	DSO
Spain	4	6	60+	DSO
The Netherlands	1	10	30+	DSO
UK	1	22	30	Supplier

Table 3.2: Gas market overview of countries covered in this report

²⁹ In some countries where the DSO is responsible for metering the TSO might be in charge of metering too but for meters directly connected to transmission network, for example in Italy

³⁰ 5 suppliers are covering 95% of the customers

³¹ In some countries where the DSO is responsible for metering the TSO might be in charge of metering too but for meters directly connected to transmission network, for example in Italy

³² The number includes both TSOs operating a nationwide network and TSOs operating a local network.

Tables 3.1 and 3.2 show that, in most countries, metering services are provided either by the DSO or by both the DSO and TSO as in case of Italy. In addition alternative models exist.

In the UK, metering services may be provided by the supplier, network operator or an unlicensed approved third party (Metering Operator). As competition has been introduced in the metering services, suppliers contract with third parties (either DSOs or independent meter operators) to fulfil their obligation. Similarly, in Germany, apart from DSOs which are base meter operators there are approximately 20 independent meter operators working which are often very successful in the industry and SME market segments.

3.2. The data management model

Differences exist between countries in the choice of the overall MDM model as well as in the details within the preferred model as shown in Table 11.3 below. The models summarised below represent both electricity and gas.

Country	MDM Model	MDM overview
Austria	Centralised access and decentralised data storage	<ul style="list-style-type: none"> - Future model described, from 2013. - At the moment, various data exchanges based on standardised data formats determined by the regulator. - From 2013, there will be a new "supplier switching platform" designed to manage the data flow between the DSO, the old and the new supplier as a "data hub" and run by the clearing and settlement agent.
Belgium	Centralised access and decentralised data storage	<ul style="list-style-type: none"> - Current model described. - In view of the possible introduction of a large number of smart meters, one central access register will be made (there are now as many access registers as there are DSOs). - Individual DSOs will still hold a database with the detailed metering data. DSOs have to give the data that is necessary to the data hub, Atrias, who will have the access register.
Denmark	Electricity: centralised access and centralised data storage Gas: decentralised	<ul style="list-style-type: none"> - Future model described, from 2013. - The Datahub is running (test phase) and will go live 1 March, 2013. According to the Electricity Supply Act, the hub is owned by the TSO. - The exchange of meter data is the responsibility of the DSOs and they are as such the hubs.
Germany	Decentralised	<ul style="list-style-type: none"> - Current model described. - Meter data exchange follows regulated processes specifying time limits, data protocols and sequence in communication between the relevant stakeholders for each process. - Each DSO is a relevant data hub in the data communication between the stakeholders for the purposes of billing and switching.
Italy	Moving from a decentralised model to a	<ul style="list-style-type: none"> - Future model described. - At the moment the decentralised communications model consists of direct exchanges of information between a DSO and supplier.

Country	MDM Model	MDM overview
	centralised one. Centralised access and centralised data storage	<ul style="list-style-type: none"> - Law 129 of 13t August 2010 has set up the Integrated Information System (referred to as SII) for the management of most information flows in the electricity and gas markets. The SII will be structured in such a way as to contain the database of delivery points, customer data as well as data on consumption and bad-payment.
Norway	Centralised access and centralised data storage	<ul style="list-style-type: none"> - Future model described. - Currently the electricity market uses a communication hub called Nubix to provide customer data from DSOs to suppliers. - A data hub model with central data storage and management is the preferred option for a smart metering environment. It requires that several tasks are transferred from DSOs to the central data management system, including customer oriented processes like supplier switching, moving and possibly billing of network charges. - Driven by the roll-out of smart metering.
Spain	Electricity: Decentralised access and data storage Gas: Centralised access and decentralised data storage	<ul style="list-style-type: none"> - Current model described. - For electricity there is direct and bilateral exchange of information among all market participants. There is no centralised storage. - For gas, there is centralised access (common IT platform for switching, developed by all DSOs) and decentralised DSO data storage. - For both sectors: - Each DSO has a data base containing the information of customers connected to their grid. - Suppliers have the right to access DSO data bases containing the consumers' information in a common standard regulated format (SIPS).
The Netherlands	Centralised access and decentralised data storage	<ul style="list-style-type: none"> - Current model described. - The DSO installs and maintains the meter and is responsible for retrieving the data. - Centralised access through the Central Access Server and decentralised data storage. - Based on the roll-out of smart metering.
United Kingdom	Centralised access and decentralised data storage	<ul style="list-style-type: none"> - Future model described. - Data communications will be coordinated centrally, through a new regulated entity Data Communication Company (DCC). - The initial scope for DCC is that it will simply act as a conduit for passing the data from the meter to someone who requests data but over time it may take on functions of central registration and data aggregation services. - Based on the roll-out of smart metering.

Table 3.3: The Meter Data Management model applied or to be applied in countries covered in this report

This table shows that there is a variety of different ways to handle meter data management. The centralised access and decentralised storage approach seems to be favoured. This is true for five of the cases; Austria, Belgium, Spain (for gas), the Netherlands and the United Kingdom.

Two of the cases have a strictly centralised approach with centralised access and storage: Denmark (not gas) and Norway. Italy is moving from a decentralised approach to a strict centralised approach and will join Denmark and Norway.

There is one case where there is a strict decentralised approach: Germany. This is particularly interesting looking at the vast number of stakeholders in the German market – about 2,000 stakeholders in the electricity market and over 1,500 in the gas market.

MDM is also an area where many regulatory changes seem to be occurring. In five of the nine case studies new regulation is in place for a new MDM-model: Austria, Denmark, Italy, Norway and the United Kingdom.

Out of the participating countries only one has rolled out smart meters: Italy.

The most important factors for supporting and choosing a particular meter data management model, stated by the participating case studies, are: cost efficiency, transparency, data security, efficient unbundling and efficient business processes. Other areas where the countries covered in this report see advantages of the chosen model are greater ability to enable the development of smart grid services, governance and proportionality.

The findings also show that the rationale for centralised MDM is strengthened in the smart metering world because of the increased amount of information exchanged. Many of the countries that have chosen to have a centralised MDM-model are doing this as a result of or to enhance the functioning of smart metering.

3.3. Customers

When it comes to discussions about smart metering, data privacy and access to data are important issues from the customer's point of view. Smart meters offer the possibility to collect much more granular data than before. The Article 29 Working Party 29 has stated that all data from smart meters is to be considered as personal data. These new functionalities have led to discussions on adapting existing laws to specifically cover meter values.

In all countries included in this report, customer privacy and security aspects of the chosen meter data management model were given a high priority. In most countries the customer clearly has the choice over who can access the smart meter consumption data. The case studies also point out specific privacy rules that exist.

In Austria, network operators have control over the data of final customers and, therefore, are responsible for data protection. According to the Data Protection Order, access of third parties to consumers' data is possible only upon approval by the customer.

In Belgium, the basic principle is that the customer owns and is in control of the data. Only with specific consent of the customer, data can be used. An exception is made for specific processes (billing, grid management) with a legal basis.

In Germany, the customer has to be informed about using data to give his agreement before the stakeholder can use his data.

In Italy, consumers will be informed in advance of why their data is collected and for which purposes and they will be aware of how their personal data is being used and by whom. Furthermore, the law and the regulation will specify that data should not be held onto for longer than necessary and that consumption data can't be used to get detailed information on a person's lifestyle.

In Norway, third parties with customer agreement may obtain access to metering data, implying that the customer is the owner of the data.

In Spain, consumers have free access to their consumption data and may forbid, in writing to DSOs, to make their data accessible to suppliers. The consumer request must be registered in the DSO data base and the switching office, OCSUM, must keep a copy of it.

The UK government is currently consulting on data access and privacy proposals. Under the proposals, the consumer would have choice over who can access the smart meter consumption data and at what level of granularity. However, licensed suppliers and distribution companies would be able to take monthly consumption reads from their customers for billing or to fulfil regulated duties, without consumer consent.

3.4. Conclusions

CEER believes that an efficient and safe information and data exchange among stakeholders is fundamental for a proper retail market functioning and customer protection and empowerment.

Table 3.3 shows that there are a variety of different ways to handle meter data management. There seems to be a favoured approach to have a centralised access and decentralised storage. This is true for five of the cases; Austria, Belgium, Spain (for gas), The Netherlands and the United Kingdom.

Two of the cases have a strictly centralised approach with centralised access and storage: Denmark (not gas) and Norway. Italy is moving from a decentralised approach to a strict centralised approach and will join Denmark and Norway.

There is one case where there is a strict decentralised approach, Germany. This is particularly interesting looking at the vast number of stakeholders in the German market – about 2,000 stakeholders in electricity market and over 1,500 in the gas market.

MDM is also an area where many regulatory changes seem to be occurring. In five of the nine case studies new regulation is in place for a new MDM-model; Austria, Denmark, Italy, Norway and the United Kingdom.

Smart metering

When it comes to discussions about smart metering, data privacy and access to data are important issues from the customer's point of view. Smart meters offer the possibility to collect much more granulated data than before. The Article 29 Working Party has stated that all data from smart meters is to be considered personal data. These new functionalities have led to discussions on adapting existing laws to specifically cover meter values.

There is a clear understanding in all countries that the chosen data management model needs clear rules regarding data access, privacy and security in protecting consumers' interests while enabling proportionate access to data by authorised parties to ensure that benefits can be delivered.

One can notice that many Member States are developing a data access and privacy framework to provide clarity about the ways in which energy consumption data from smart meters can be accessed, by whom, for which purposes, and the choices that consumers should have about this. At the moment, some countries have, or are in the process of introducing, specific legislation regarding meter data privacy. The case studies point out what specific privacy rules exist in terms of access to data. The report notes that in nearly all cases the consumer has the choice over who can access the meter data.

Due to the fact that market design and conditions³³ differ across Europe, CEER believes that different countries might require *different meter data management models*. Furthermore, CEER believes that the elaboration and the implementation of policies on suitable market and meter data management models in different countries require a *step by step approach* and therefore an adequate time-frame.

At this stage, CEER does not intend to suggest a specific MDM model. Keeping in mind that regulation should be output-based and technology-neutral, CEER is of the opinion that different countries might require different meter data management models, on the basis of market design specificities in different countries and in line with the data management models which are already being put in place in some countries.

However, CEER believes that data management is crucial to a well-functioning energy market and therefore plans to continue its work on smart metering issues and as next steps, in 2013, CEER is planning to work on Advice on retail market data management for better market functioning.

³³ Number of involved actors, roles of stakeholders involved, etc.

Annex 1 – CEER

The Council of European Energy Regulators (CEER) is the voice of Europe's national regulators of electricity and gas at EU and international level. Through CEER, a not-for-profit association, the national regulators cooperate and exchange best practice. A key objective of CEER is to facilitate the creation of a single, competitive, efficient and sustainable EU internal energy market that works in the public interest.

CEER works closely with (and supports) the [Agency for the Cooperation of Energy Regulators \(ACER\)](#). ACER, which has its seat in Ljubljana, is an EU Agency with its own staff and resources. CEER, based in Brussels, deals with many complementary (and not overlapping) issues to ACER's work such as international issues, smart grids, sustainability and customer issues.

The work of CEER is structured according to a number of working groups and task forces, composed of staff members of the national energy regulatory authorities, and supported by the CEER Secretariat.

This report was prepared by the Retail Market Functioning Task Force of CEER's Customers and Retail Markets Working Group.

Annex 2 – List of abbreviations

Term	Definition
ACER	Agency for the Cooperation of Energy Regulators
AEEG	Italian NRA
AMR	Automatic meter reading
BSI	German Federal Office for Information Security
CEER	Council of European Energy Regulators
CNE	Spanish NRA
CRM WG	Customers and Retail Markets Working Group
DCC	Data Communications Company
DMS	Demand Monitoring Software
DSO	Distribution System Operator
EDI	Electronic Data Interchange
EDIEL	Electronic Data Exchange for the Electricity Industry
EnWG	Energiewirtschaftsgesetz, German Energy Industry Act
GB	Great Britain
GEMA	British Gas and Electricity Markets Authority
GGP	Guidelines of Good Practice
GPKE	Geschäftsprozesse zur Kundenbelieferung mit Elektrizität, German industry rules for switching supplier
GTC	General Terms and Conditions
HAN	Home Area Network
IHD	In-Home Display
IT	Information Technologies
MID	Measuring Instruments Directive 2004/22/EC
MIG	Message Implementation Guide, protocols made by UMINRA
MIG 6	Message Implementation Guide, version “Smartmeter Ready”
OCSUM	Oficina de Cambio de Suministrador, Spanish Office for Switching Supplier
Ofgem	British NRA
OMS	Outage Management System
RMF TF	Retail Market Functioning Task Force
SII	Sistema Informativo Integrato
SIPS	Sistema de Información de Puntos de Suministro
SMTP	Simple Mail Transfer Protocol
ToU	Time of use
TPA	Third Party Access

Term	Definition
TSO	Transmission System Operator
UMIG	Utility Market Implementation Recommendations
UMIX	Utility Message Information Exchange
UK	United Kingdom
VAN	Value Added Network