'One size fits all' smart meters?

The implementation of smart meters in The Netherlands is presently obstructed awaiting adaptation of the legal framework by amendment of the underlying law. This amendment may provide an opportunity window in which the regulated functionality of the smart meter can be reconsidered. It may well be that the legislated activities concerning smart metering, specifically those pertaining to the distribution network operator, could be simplified in the foreseeable regulation as vested in various documents, among which the NTA 8130, the Dutch metering standard. This amendment may meet the objections that have been brought forward by the Senate in the discussions on this law and at the same time do away with the complex regulation as currently envisaged. The objections by the Senate encompass the obligatory installation of the smart meter, and are primarily based on privacy considerations. A second objection concerns the applied technology that may, caused by new developments, turn obsolete prior to the life expectancy of the meter hardware. The smart meters are supposed to be depreciated in a life span of some 10 – 15 years while the applied information technology has a life cycle of roughly 3 years. Specifically the fast developments in the field of software in the context of security, is seen as an important point of concern. Computational demands for security measures may increase fast, and as such rendering the smart meter hardware obsolete. Below we present some considerations that may be taken into account when revision of the underlying law is under discussion.

A view on the current concept of smart metering

Our view on the possible adaptation of the smart meter concept encompasses separation of the basic metering functionality and the more advanced process and communication part (the intelligence or the energy modem, we'll revert to this term later). In this concept we also assume a strict separation between transport and production/delivery (also known as unbundling) in line with full liberalisation and the current market design in The Netherlands. Consequently this also implies a full separation between roles/responsibilities of network companies and those of production/delivery companies.

Concerning the use of information technology in the context of network governance we distinguish three levels: substations (mid voltage units, MV), low voltage units (LV, 10kV/400V) and end customer level (consumer and mid/small enterprises). Fundamental difference is that MV and LV units employ real time based SCADA (Supervisory Control And data Acquisition) technology contrary to the IP (Internet Protocol) based technology at end customer level with smart metering, the latter is not real time based. This brings the insight that the smart meter will not per se contribute to efficient and effective network governance; this point will be elaborated on later in this text. Crucial in this concept is that the smart metering functionality is separated into a set of functions required for legal obligations (with regulatory enforcement) and another set of functions that can be exerted in the free commercial domain, which naturally does not require energy regulation of any kind but will have to comply with standard competition law. Legal obligations encompass billing, moving house, switching and facilitating 6 times a year informing the end customer on its energy usage carried out by the supplier, as currently foreseen in the laws to be adapted. This information activity is obligatory by EU directives, which brings about that meter readings have to be collected by the network company and have to be provided to the supplier. We estimate that in total some 12 -14 times per year the network company will remotely read out the smart meter and provide the data to the supplier. The amount of data needed for these tasks is very low and so are the associated costs for both realisation and operation.

The functions for legal obligation are not prone to fast technology developments; digitised measurements exist for more than 30 years and can be considered mature technology. In addition, the demands for collecting data 12 -14 times per year will also not change from a procedure perspective. As such both technology and underlying processes can be considered as very stable.

The advanced functions, provided by the energy modem, include new propositions to increase energy efficiency (so-called time-of-use contracts), direct feedback of used energy via a display unit (continuous information on the use of gas, electricity and heat based on short cycle (10 secs) interval data), and propositions to accommodate for instance decentral generation, electric cars, heat pumps etc. In this context the network company does not have to provide the interval data that is required for these purposes, this data is obtained from the smart meter directly, i.e. the data does not leave the premises and stays 'in house'. This data is then provided by a P1 type port or, for that matter, a similar type of measurement device fully outside the smart meter. We remark that this technology is readily available on the market. In essence, a smart meter is not required for this purpose. Leaving the interval data 'in house' does in fact away with the privacy issue and all use of this data can be easily covered by private law arrangements, hence by normal contracting. Financial settlement is then based on the contractual setting arranging that, if so required, the interval data is provided directly to the supplier. We thus conclude that a legislative framework is already fully in place and operational, and therefore does not require separate energy regulation and upholding by policy maker EZ and regulator NMa. In such an arrangement, what are then the regulated tasks for the network companies?

Roles network company and supplier, smart metering functions

From the perspective of the energy value chain in the current market structure the (regulatory) tasks of the network companies (distribution and transmission) concern the provision of transport services for energy (gas, electricity and heat) and the governance of the infrastructure associated with this. In summary transport services and asset management. In this context we like to remind the reader that the primary purpose of the smart meter was, and in fact still is, serving the end customer; the smart meter is the foundation to collect data to realise the objectives covered by the enactments Market Model (31 374) and Energy Efficiency (30 320), both originating from EU directives. These objectives entail adequate billing, faster and better information handling to support processes, insight into energy usage for end customers and efficient network governance. Particularly concerning the objective efficient network governance, it can be debated whether smart metering, as intended with its current functionality vested in the NTA 8130, is an essential information source given its non-real time character. In addition, the importance of limiting/disconnecting energy supply for efficient network governance can also be questioned. The arguments for limiting/disconnecting differ per actor in the energy value chain: for the supplier this is default of payment, for the network company this concerns calamities, also fraud is seen as an argument. However, in case of both fraud and default of payment, energy is used for which is not paid for. This means losses for the supplier and not for the network companies. It is plain logic that the supplier develops possible means within institutional arrangements to be able to anticipate on this. In fact these means are readily available in the current legislation and therefore do not require specific energy rules and regulations. Thus we conclude that a legal framework is present that allows theft (fraud and default of payment) to be dealt with. In practice: the network company collects monthly meter data, the aggregation of these data should comply with the energy throughput observed in each 10 kV/400 V LV unit.

In this way the network company provides information to the suppliers who can then reconciliate their usage data that forms the foundation for billing. If so required possible theft can be detected and appropriate measures can be taken within the legal framework. In case of calamities anticipating measures will not seize on the level of the end customer, disconnect/limiting just 1 user will not exert a large effect. In such a situation a network company will start disconnecting at 10 kV level, usually tens to a few hundred customers simultaneously. This brings the insight that for the network company disconnecting/limiting an individual end customer is not essential for fulfilling legal obligations: transport services and asset management. From a business point of view disconnecting/limiting is however an issue. To prevent disadvantage the supplier can decide to limit provision of energy or even disconnect a single end customer. Finally we like to remark that with the advent of the capacity tariff in 2009 the network company in essence does not need meter data for transport services network and governance, since in the 'Leveranciersmodel' it is the supplier that now has been assigned this task for consumers and small/medium enterprises.

Even in case of massive feed in of electricity by PV solar systems and micro CHPs the network companies only need accumulated energy information (energy taken from the network minus local feed-in generation) in order to maintain the assigned transport capacity within operational limits. To this end a mechanism is operational that already proved to be useful for many years: the allocation system. Thus we state that it is mandatory for the supplier to comply with this mechanism, also in case of decentral generation and the expected increase in usage by heat pumps and electric cars. The supplier complies with this system based on either classical profiling or on interval data from a smart meter or another similar type of measuring device behind the smart meter; after all, this takes place in the free commercial domain and can be supported by classical contracting.

Thus we can arrive at the conclusion that the implementation of the smart meter functionality can be achieved transparently in two realisations: a basic meter and an advanced energy modem that can communicate in analogy with the telecom and cable world. The basic meter is provided by the network company and entails a very simple device that only allows remote collection of the meter reading (no interval data and no limiting/disconnecting). Associated costs can be kept low by designing the basic meter such that varying communication protocols can be used by exchangeable units for PSTN, Coax (fixed lines), GSM, UMTS, HSDPA (mobile), RF (used in the US and Canada) and PLC (Power Line Communication). Cost benefit analysis for the 12 – 14 times meter reading will reveal the most appropriate method with financial boundary conditions set by the declared meter tariff as vested in regulation. Does the NTA then becomes less complex? Certainly, in fact the functions for interval data and limiting/disconnecting can be omitted from the NTA, as such the functionality to be provided by the Central Access Server becomes simpler as well. These functions will now be vested in the energy modem that is provided to the end customer by the supplier, fully on a voluntary basis supported by classical contracting. Also enforcing regulation will be less complicated; this then only concerns collecting meter data 12 -14 times per year. All in all the associated regulatory efforts and thereby costs will be lower, only regulated matters will need enforcing. At the same time this meets the objective of parliament by keeping the metering tariff at the level of 2005 plus the consumer price index. All associated higher costs for interval data and the like will be included in the proposition of the supplier to the end customer that entails the energy modem concept.