

# **Smart Metering: Cost Benefit Analysis of Potential Dissemination and Results of Pilot Projects**

Short Position Paper to assist the ERRA  
Licensing and Competition Committee

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# Focus of the Position Paper

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### Smart metering (cost benefit analysis of potential dissemination and results of Pilot Projects)

Description of the work-plan issue from the work plan of ERRA Licensing/ Competition Committee:

“In most of the countries the decision regarding dissemination/ deployment/ spread of smart meters is based on the results of cost benefit analysis (CBA). Some of the projected cost elements of the CBA and the change in customer behaviors (possible benefits) could be better defined with the results of well prepared and performed Pilot Studies. The information on the structure, the elements and on the reliability of the CBA results and the preparation, the conditions, the implementation and the results of Smart metering Pilot Projects could be interesting and useful for those who are before such analysis and project.”

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## List of Abbreviations

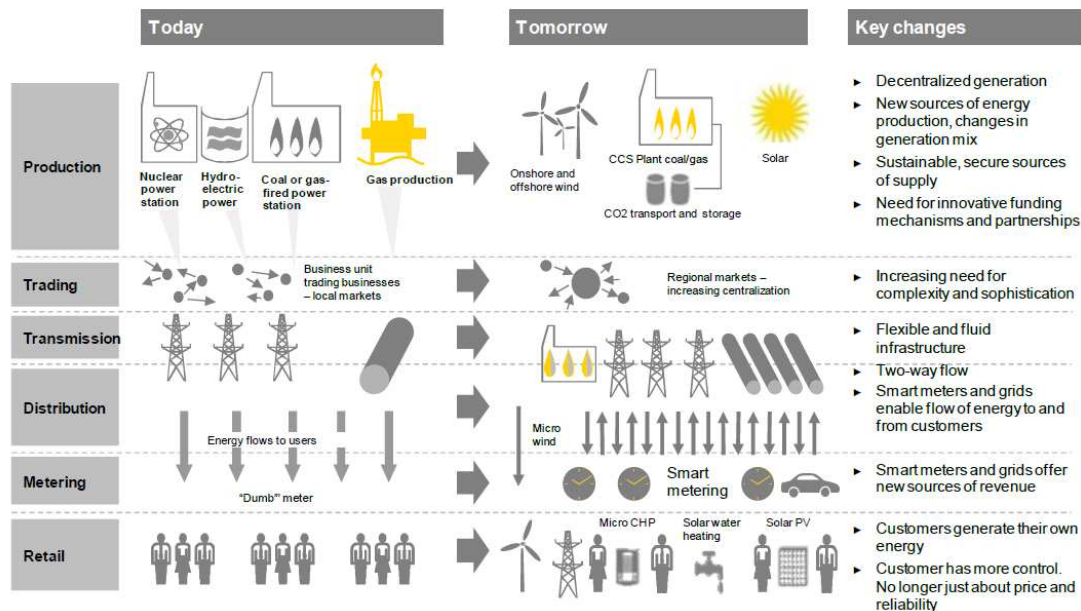
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SM-Smart Metering  
SMGW - Smart Metering Gateway  
MID-Measurement Instruments Directive  
CBA-Cost Benefit Analysis  
IHD-Intelligent Home Display  
DSO-Distribution System Operator  
CEER- Council of European Energy Regulators  
Prosumers – a person who produces and consumes energy  
EnWG – Energiewirtschaftsgesetz, German Energy Law  
NPV –Net Present Value  
ANRE - Romanian Regulatory Authority for Energy)  
AMM – Automated Metering Management  
NSMP – National Smart Metering Project

## Introduction of Smart Metering

### Smart Metering Definitions and Basics

Those new climate policy targets which are closely related to energy policy accelerated the restructuring of grid based energy supply, especially for electricity and gas. Some countries made clear steps to shift the electricity supply system from a centralized to a decentralized system, and the transformation of the energy sector is taking shape. While in the past energy flowed in only one direction and information about these flows was highly limited, the decentralized energy supply system of the future is characterized by a two way flow of information and energy. Significant changes are also taking place on the customer side: inactive consumers are increasingly becoming “Prosumers”, who are actively helping to shape the energy supply system. Overall, these changes are especially increasing the requirements for the measurement and communication technologies as well as the data processing systems. [10]



1. Figure: The turnaround in energy policy is accelerating the transformation of the energy sector [10]

The different technical characteristics and features of smart metering systems and intelligent meters allow efficient and tailored deployment for a variety of user groups. Therefore, the economic assessment of a roll-out must distinguish between smart metering systems and intelligent meters.

Smart metering system [10]: the communications hardware and software and associated system software that creates a network between advanced meters and business systems and which allows collection and distribution of information to customers and other parties, such as competitive retail providers, in addition to providing information to the operator (transmission system, distribution system or other stakeholder: depends on the concept of deployment) itself.

All end consumers fulfilling a stated mandatory criteria set by the energy law (§ 21c of EnWG) in Germany must be equipped with a smart metering system in the future. By combining a meter with a communication unit, the Smart Meter Gateway and with a security module, the meter turns into a smart metering system. While the actual measurement still takes place in the measuring system, the new characteristic is the requirement to integrate the meter into a proper communication network.

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### **Introduction of Smart Metering**

It is not possible to establish any specific requirements for the meters themselves, they only need to satisfy the requirements of the Measurement Instruments Directive (MID) and to be safely integrated into a smart metering system which is compliant to a protection profile. [10]

Intelligent meters [10] can be installed to reflect actual energy consumption and actual average usage time within the confines of the metering system. This implies that those intelligent meters are not initially integrated into the external communication network (but these meters must have the ability to be upgraded through integration with the communication network). Intelligent meters can offer a cost-efficient option for potential energy savings and an increase in energy efficiency.

To provide clarity on the term, the following definition is suggested [1]: Smart Metering is capable of the automatic reading, processing and transmission of metering data. It has the possibility of bidirectional data communication in real time (or with only a small time lag). It can support additional services and applications, e.g. home automation, remote (dis-) connection of supply or load limitation and remote update of meter firmware to enable new services, communication protocols, etc.

The technical design of smart metering systems varies widely across countries. They generally have a common understanding of what capabilities a smart meter should possess but often chose a subset of these capabilities for their roll-out as suits the market arrangements and the result of CBA of their country. [4] [10]

### **Smart Metering Functionalities**

The consumer and the metering operator are able to achieve benefits from the deployment. The most important novelty is the wide range of remote functions.

Some of the key functions:

- Measurement of energy consumption and injection (if applicable)
- Remote reading of meter data, either regularly submitting consumption data (e.g. as load curve) or submitting meter readings on demand
- Submitting (and displaying) information on tariffs, historic consumption, comparison values, etc. to the meter
- Storage of meter readings and/or load curve (e.g. until next regular submission or in case communication is interrupted)
- Remote connection/disconnection and load limitation
- Remote firmware upgrades, programming or addition of new functions to the meter
- Transmitting on demand of diagnosis of power quality/condition and voltage level
- Automatic transmission of fraud alarm
- Communication with other meters or a separate (multi utility) communication device and household appliances
- Prepayment function, so that the meter can be used as a budget meter
- Display on the meter itself and transmission of meter data to an external display

### **Driving Forces of Smart Metering**

Due to the regulatory push by the European Union's Third Energy Market Package, most member have, or are about to implement some form of legal framework for the installation of Smart Meters. The main driving forces behind the development of smart networks are green initiatives, the development of renewable energy source integration and energy efficiency, as well as the assumption that well-informed customers will use less energy. Therefore the implementation of

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smart networks and smart meters is regarded as being an important instrument in the European 20/20/20 targets as regards reducing energy consumption.

## Cost Benefit Analysis

The exact elements of the CBA are variable and highly dependent on the exact deployment area and services. The focus of this chapter is to introduce the possible elements to give a useful input for stakeholders in the planning period of Smart Metering installation. The data hereunder is the same used in the analysis of the Smart Region Landscape report [6], so it is coherent with the European summarization in the next chapter. There is some estimated breakdown of costs which are not published at this stage due to commercial and procurement sensitivities, the elements are just listed in these cases. There are also a lot of non-monetary benefits which should be reviewed in the evaluations, these are listed below. The environmental and economic changes should also be considered properly, the literature references ([5] [6] [9] [10] of this paper contains some detailed methodology for that. [5] [6]

### Possible Expenses of Deployment

Some costs can be directly measured or calculated by the actor(s) carrying out the smart metering roll-out, while others are typically estimated since their prices, or very good proxies, can be obtained in the market place. The costs should include capital, ongoing/operational, and transitional costs. Collecting information on the roll-out's costs is necessary for determining its return on the investment, whether it is positive, and if so, when the scenario breaks even. Identifying these costs requires meticulous itemization of all the important costs. These cost elements could be the foundation of a CBA, but the exact methodology is highly dependent on the unique circumstances. The priority should be the cost effectiveness in the whole system. The possible further developments should also been considered. [5]

*1. Table: Summarization of the cost elements [5]*

| General category | Type of cost                                                                                   |
|------------------|------------------------------------------------------------------------------------------------|
| CAPEX            | Investment in the smart metering system                                                        |
|                  | Investment in IT                                                                               |
|                  | Investment in communications                                                                   |
|                  | Investment in in-home displays (if applicable)                                                 |
|                  | Generation                                                                                     |
|                  | Transmission                                                                                   |
|                  | Distribution                                                                                   |
|                  | Avoided investment in conventional meters (negative cost, to be added to the list of benefits) |
| OPEX             | IT maintenance costs                                                                           |
|                  | Network management and front-end costs                                                         |
|                  | Communication/data transfer costs (inc. GPRS, Radio Communications, etc)                       |
|                  | Scenario management costs                                                                      |
|                  | Replacement/failure of smart metering systems (incremental)                                    |
|                  | Revenue reductions (e.g. through more efficient consumption)                                   |

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| General category | Type of cost                                                             |
|------------------|--------------------------------------------------------------------------|
|                  | Generation                                                               |
|                  | Transmission                                                             |
|                  | Distribution                                                             |
|                  | Meter reading                                                            |
|                  | Call center/customer care                                                |
|                  | Training costs (e.g. customer care personnel and installation personnel) |
| Reliability      | Restoration costs                                                        |
| Environmental    | Emission costs (CO2 control equipment, operation and emission permits)   |
| Energy security  | Cost of fossil fuels consumed to generate power                          |
|                  | Cost of fossil fuels for transportation and operation                    |
| Other            | Sunk costs of previously installed (traditional) meters                  |

### Benefits of the Installation

Table 2 reports some suggested formulae (not exhaustive) for the monetization of possible benefits related to the smart metering roll-out. It is need to be stressed that some of these benefits might be fully reaped only when additional Smart Grid capabilities are implemented together with the smart metering infrastructure (e.g. reduction of outage times through advanced monitoring and real -time network information; reduced losses via voltage control). If these benefits are included in the cost-benefit analysis, it should be clearly mentioned which Smart Grid capabilities are envisioned together with the smart meter roll-out to achieve those benefits and their cost. [5]

*2. Table: Summarization of benefits [5]*

| Benefit                                            | Sub-benefit                                                          |
|----------------------------------------------------|----------------------------------------------------------------------|
| Reduction in meter reading and operations costs    | Reduced meter operation costs                                        |
|                                                    | Reduced meter reading costs                                          |
|                                                    | Reduced billing costs                                                |
|                                                    | Reduced call center/ customer costs                                  |
| Reduction in operational and maintenance costs     | Reduced maintenance costs of assets                                  |
|                                                    | Reduced costs of equipment breakdowns                                |
| Deferred/avoided distribution capacity investments | Deferred distribution capacity investments due to asset remuneration |
|                                                    | Deferred distribution capacity investments due to asset amortization |
| Deferred/avoided transmission capacity investments | Deferred transmission capacity investments due to asset remuneration |
|                                                    | Deferred transmission capacity investments due to asset amortization |
| Deferred/ avoided generation capacity investments  | Deferred generation investments for peak-load plants                 |
|                                                    | Deferred generation investments for spinning reserves                |
| Reduction of technical losses of electricity       | Reduced of technical losses of electricity                           |
| Electricity cost savings                           | Consumption reduction                                                |
|                                                    | Peak load transfer                                                   |
| Reduction of commercial losses                     | Reduced electricity theft                                            |

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| <b>Benefit</b>             | <b>Sub-benefit</b>                                                                       |
|----------------------------|------------------------------------------------------------------------------------------|
|                            | Recovered revenue relating to contracted power fraud                                     |
|                            | Recovered revenue relating to incremental contracted power                               |
| Reduction of outage times  | Value of service                                                                         |
|                            | Recovered revenue due to reduced outages                                                 |
|                            | Reduced cost of client compensations                                                     |
| Reduction of CO2 emissions | Reduced CO2 emissions due to reduce line losses                                          |
|                            | Reduced CO2 emissions due to wider spread of low-carbon generation sources               |
|                            | Reduced CO2 emission due to truck rolls of field personnel                               |
|                            | Reduced fuel usage due to truck rolls of field personnel                                 |
| Reduction of air pollution | Reduced air pollutants emissions due to wider diffusion of low carbon generation sources |
|                            | Reduced air pollutants emissions due to reduced line losses                              |

Once costs and benefits have been estimated, there are several ways to compare them in order to evaluate the cost-effectiveness of the scenario. The most common methods include Annual Comparison, Cumulative Comparison, Net Present Value and Cost-Benefit Ratio.

## European Smart Metering Landscape

The developments since 2011 showed that progress were strongest in the countries with a significant regulatory push. Many of the so-called dynamic movers have defined very ambitious rollout plans. In addition, in most of these countries a clarification of the minimal requirements of smart meters was clarified.

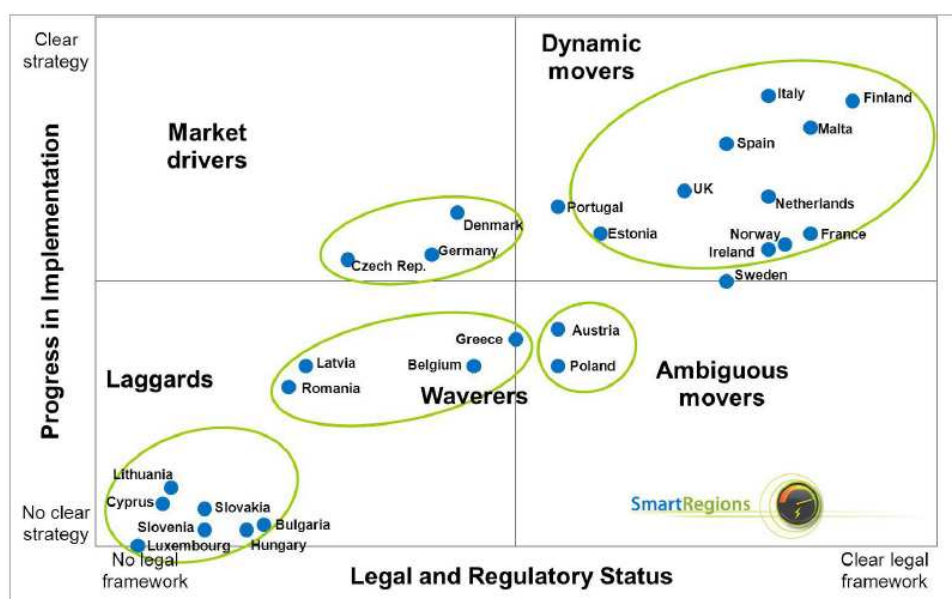
On the contrary, countries, which are classified as market drivers, there is only moderate progress. In general it should also be stated that in many countries there is still a lot of skepticism among customer associations and privacy activists.

In most countries the DSO are responsible for the installation and maintenance of the smart meters. Only in Germany and the UK the suppliers are responsible. [4] [6]

The EU aims to replace at least 80% of electricity meters with smart meters by 2020 wherever it is cost-effective to do so. This smart metering and smart grids rollout can reduce emissions in the EU by up to 9% and annual household energy consumption by similar amounts. To measure cost effectiveness, EU countries conducted cost-benefit analyses based on guidelines provided by the European Commission. A similar assessment was carried out on smart meters for gas. [11]

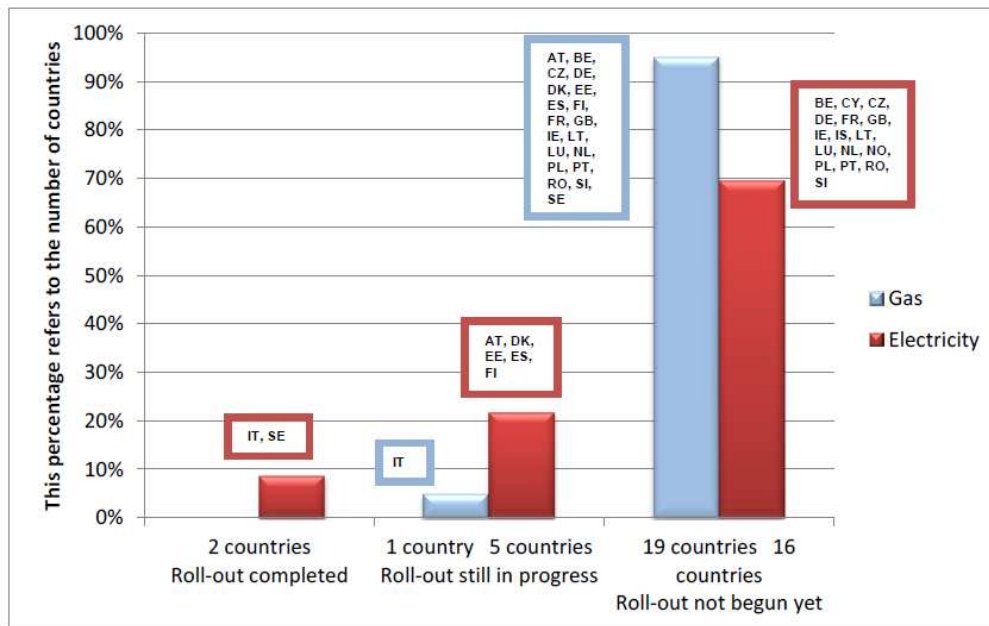
A 2014 Commission report on the deployment of smart metering found:

- Close to 200 million smart meters for electricity and 45 million for gas will be rolled out in the EU by 2020. This represents a potential investment of €45 billion
- By 2020, it is expected that almost 72% of European consumers will have a smart meter for electricity. About 40% will have one for gas
- the cost of installing a smart meter in the EU is on average between €200 and €250
- On average, smart meters provide savings of €160 for gas and €309 for electricity per metering point (distributed amongst consumers, suppliers, distribution system operators, etc.) as well as an average energy saving of 3%. [11]



2. Figure: Status of implementation and regulation in European countries [6]

### Energy Regulators Regional Association European Smart Metering Landscape



3. Figure: CEER country status report in 2013 [4]

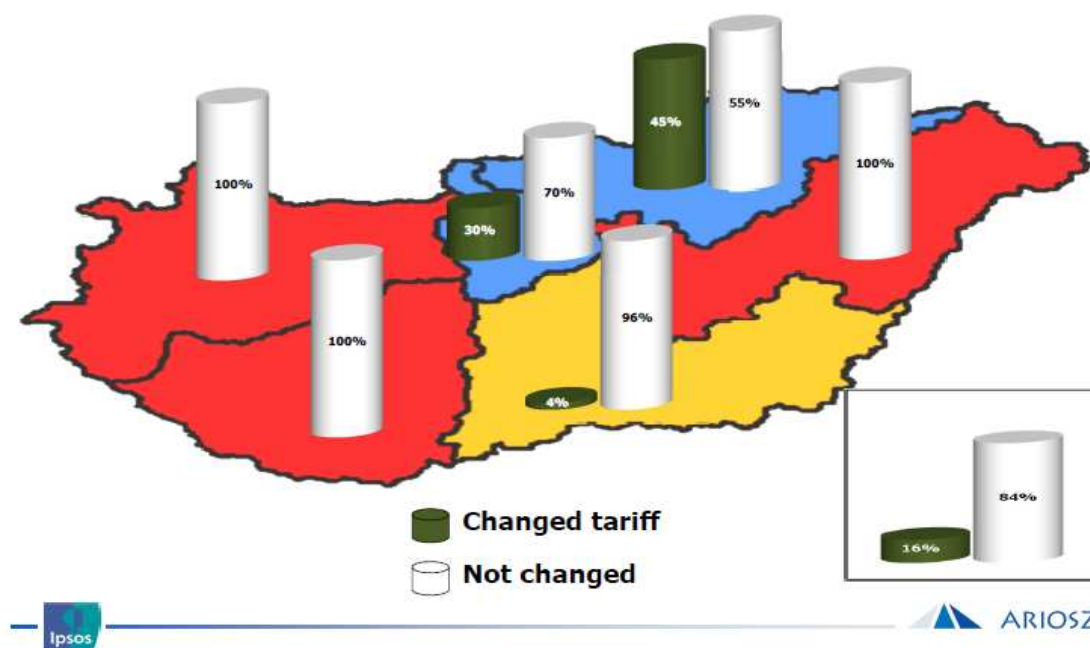
## Summary of the Hungarian Pilot Project

### Background information about the project

The 6 Distribution System Operators worked out a pilot project to test the effects including a limited cost-benefit analysis of Smart Metering under the supervision of The Hungarian Energy and Public Utility Regulatory Authority. The outcome of this project is yet to be published but the composition and the underlying principles are also instructive.

The project started in 2012 and the last data were collected in 2014. There were a test and a control abundance (test: 12 000 measurements, control: 6000 measurements) which are considered statistically representative even at a country-scale. The attitudes of the consumers were also considered (4 main groups based on activity and consuming profiles). Questionnaires were prepared to survey the basic residential knowledge about the possible benefits of Smart Metering, to examine the skills and habits of the users. The Distribution System Operators informed the consumers about the opportunities to buy the electrical energy based upon new, different tariff structures/ groups, and encouraged them to switch from ordinary household tariff to new tariff groups: to “A2” or “smart” (detailed information in [7] and [8]).

### Smart Metering tariff distribution



4. Figure: Tariff changing ratio in Hungary [7]

### Observations

Figure 4 represents the effects of the deployment: the 100% means all of those customers who were equipped with a smart metering device: the consumers who changed tariffs moved to A2 or smart tariff, in those cases the education and the marketing was successful. The others remained with the conventional tariff system so in these cases they did not have any chance saving money through the new tariff system and through shifting consumption from “on peak” to “off peak” hours. They

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possibly saved money through reduced consumption facilitated by the fact that they could continuously monitor their consumption on the installed smart meter. [7]

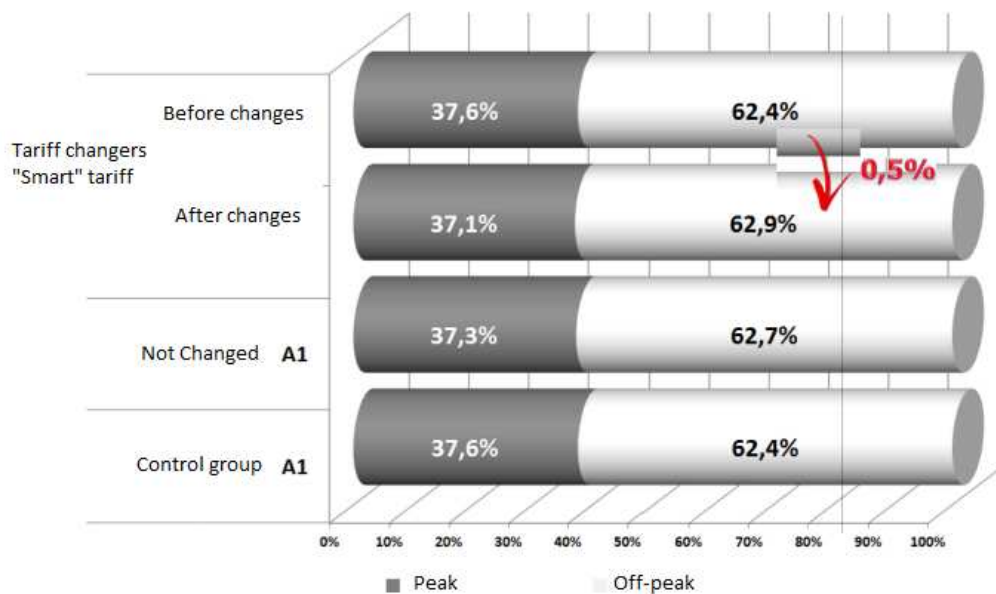
The peak shifting processes cannot be seen from the collected data, the changes in the consumption profiles can be explained by the intensive communication related to Smart Metering. The further education/orientation of the consumers could cause an environment which facilitates more positive change in customer behavior. The DSOs collected very useful technical information regarding operation and maintenance of smart meters and data communication channels. It has to be noted that different technical solutions including multi-utility's applications (power, gas, water, district heating) were studied and used by the DSOs and the solutions, reliabilities, cost effectiveness and other issues related to those resulted in very useful experiences. [7] [8]

## Case Studies

### Hungary

In the current legal framework the electricity DSO is responsible for the installation, calibration and maintenance of the meters. Meter readings are the responsibility of the network operators (TSO, DSO). DSO has to transfer the metered data to the TSO and to the traders including the universal supply provider. There should be at least one meter reading per year for small, mainly household customers. In February 2012 the distribution network operator E.ON Hungary announced the implementation of a smart metering pilot project. The project was implemented in cooperation with Magyar Telekom. Two other DSOs; ELMŰ/EMASZ and their key shareholder RWE were also cooperating with local gas and water utilities in Budapest to carry out a joint multi-utility smart metering pilot including electricity, gas and water. In this project RWE and ELMŰ/EMASZ tested the use of smart meters to collect information before any decision of a rollout.

The outcome of the project indicates that the changes of the customer behavior resulted in not that what was predicted (approximately the half of the predictions). The tariff change resulted in not as a driving force of the restructuring of the timing of the consumption, no structural change happened in the timing structure of the consumptions. [7] [8]



5. Figure: Peak and off-peak ratio in consumption with effects of the tariff change [7]

Figure 5 represents the consumer behavior changes. On the bottom the control group is shown. The consumers who still chose the conventional tariff are above that, and it is clear that these ratios are almost the same. The interesting part is the situation of the smart tariff: only 0,5% ratio change in the peak and off peak consumption was measured, so it can be stated that the fact of the tariff change alone does not mean a behavior change. [7]

The evaluation of the pilot project is in progress. To summarize short, the results of the CBA were similar in all the cases: the NPV was negative at the end of the project, so there was insufficient profit

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for the return of the investment. The DSOs concluded that the rollout is only recommended in special cases like small (household size) power plants, special tariff for heat pumps or consumers who usually have overdue debts (non-payment).

The Hungarian Act on Electrical Energy facilitates pilot projects:<sup>1</sup>

- The DSOs are allowed to carry on pilot projects
- The consumers have to cooperate and use the smart meters, however they have to be provided with detailed information throughout the project
- The DSOs cannot impose any extra costs on the consumers due to the deployment of smart meters during pilot projects
- The regulator is the supervisor of the pilot projects

The final governmental decision on the future rollout of smart metering is not known yet so there is no schedule for further deployment. However further smart meter project will be carried out by a special TSO owned company to collect more information. [7] [8]

### Ireland

Ireland's smart meter rollout will involve about 2.2 million electricity consumers and 600,000 gas consumers with an investment up to €1 billion. It is expected to yield a net benefit of around €229 million over 20 years. The now running second phase is expected to last for less than 2 years up to 2014. Thereafter the third phase of building and testing will last through 2015, followed by deployment over two to four years between 2015 and 2019.

The report which follows presents the detailed findings of a PwC analysis of the national costs and benefits associated with the roll-out of a National Smart Metering Program (NSMP). A high-level overview of the results range, split between gas and electricity smart metering programs is shown in this table:

3. Table: NSMP outcome range [9]

| NPV '000s   | Pessimistic | Central  | Optimistic |
|-------------|-------------|----------|------------|
| Electricity | -128,73 €   | -59,18 € | 105,61 €   |
| Gas         | -11,24 €    | 5,13 €   | 21,50 €    |
| Total       | -139,97 €   | -54,05 € | 127,11 €   |

In aggregate, the net result is marginally negative under the central scenario. Given the scale of overall NSMP expenditures, as well as the significant uncertainty which still attaches to certain of the most significant assumptions of cost, the result should be interpreted as broadly neutral. Equally, certain benefits attaching to smart metering (e.g. enablement of smart grid and greater use of renewables) are not capable of quantification and, for this reason, not considered in the analysis. The result for electricity is marginally negative in aggregate, compared with a very modest positive in the case of gas. In this regard, it should be noted that the gas NSMP is not stand-alone in nature – rather there is a significant dependence on infrastructures put in place for the electricity program.

<sup>1</sup> At the end of February, 2016 the Hungarian Government issued a new degree regulating the conditions of a centralized smart metering pilot project.

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Using a 5% discount rate, the NPV for the electricity CBA in aggregate is negative at -€59 million. Given the scale of the expected total program spend, and the fact that many of the costs provided for the purpose of advising CBA assumptions are indicative only, the result should be interpreted as broadly neutral and requiring testing with cost assumptions which are based on substantial market soundings. While the CBA model is not-distributional in nature (it is hard to predict how incremental costs or benefits flow through the system), it is interesting to note that electricity suppliers are negative in NPV terms. The scale of the net cost in the case of networks is very substantial, and reflects in large part the assumed national use of a GPRS communications solution with a high attendant annual operating cost. [9]

4. Table: Summarization of CBA results by stakeholders [9]

| Stakeholder          | Discounted NPV |
|----------------------|----------------|
| Consumer             | 197,12 €       |
| Residential consumer | 199,83 €       |
| SME                  | -2,71 €        |
| ESBN                 | -319,75 €      |
| SM&IHD               | -354,90 €      |
| Other CAPEX&OPEX     | -432,08 €      |
| Avoided costs        | 467,23 €       |
| Suppliers            | -45,83 €       |
| Generation           | 109,29 €       |
| Total                | -59,18 €       |

### Romania

#### Smart metering deployment

ANRE (Romanian Regulatory Authority for Energy) order for approving a smart metering rolling-out timetable for period 2017-20 was postponed from March 2016 to March 2017. [13]

The Authority took this decision based on the lack of a relevant analysis of costs and benefits of this process.

ANRE representatives explain that, following the pilot projects implemented so far, the results were not uniform and the authority must conduct a cost-benefit analysis for all distribution operators. So far, ANRE approved 18 pilot projects worth nearly 69.6 million lei.

“Until 1 November 2015, the progress of the pilot projects approved by ANRE in terms of value was 83% and physically approximately 85%. (...) Post-implementation results on the benefits covered are not relevant to all pilot projects due to the very short period that passed since their completion and the reporting date on achievements (lack of relevant durations for monitoring). We appreciate there is a need for a monitoring period of at least 6 months of finalized projects to obtain data sufficient to provide eloquent premises for decision making regarding the full “roll-out”, says the order’s substantiation note. [13]

However, cost-benefit analyzes submitted by distribution operators do not allow a full comparative analysis of the results, say ANRE representatives.

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“There is no uniformity in assessing the costs and benefits of pilot projects. The results of cost-benefit analyzes are positive for Enel, E.ON Distribuție Romania and FDEE Transilvania Sud and negative for CEZ Distribuție. We deem necessary ANRE to conduct a detailed cost-benefit analysis model and, as discussed in the Regulatory Committee meeting dated 22.12.2015, ANRE to conduct a cost-benefit analysis for all distribution operators by means of a consultant/third party in order to avoid accusations of lack of transparency or lack of objectivity”, shows the authority. [13]

### ANRE suggestions for a beneficial rollout

- The minimal function requirements that should be met the smart metering systems (SMS) are stipulated and defined by EC Recommendation no. 148/2012. The minimal functioning requirements must respect this recommendation (the analysis is made for the SMS implemented in the EU countries covered by the regulations issues by the European Parliament and the EC).
- The cost-benefit analysis for the implementation of the SMS shall take into account, at least, two issues, usually not clearly stated by the official documents, namely: the functioning condition of the low voltage networks and the annual average consumption per consumption place for which is cost-effective the inclusion of the SMS. In order to have a correct operation of the SMS, the network must meet a number of minimum technical conditions, even more in case of adopting the solution of transmitting data from meter, from the consumption place by PLC. Most of the times, the SMS installation requires additional works to the customer's electricity network (at least, in Romania), which involve costs that influence the profitability. Also, there are large areas – not only in the rural areas – where the average annual consumption on consumption place is so low that the investment for SMS is definitely unprofitable. This situation has a decisive influence on the maximum number of consumers for which the SMS investment is made in rentable conditions.
- It should be taken into account that an important part of the estimated benefits (usually focused on the reduction of losses) contains a high degree of uncertainty by the very way the activities are currently being conducted to highlight the consumption and the billing (2-3 readings per year). On the basic situation (which is the reference for the cost-benefit analysis – CBA), the income chapter is built on estimations and this produces uncertainty and, hence, a risk for the CBA result supporting the roll-out decision.
- In order to determine the roll-out, an implementation timetable shall be settled which requires the implementation area classification based on a multi-criteria analysis. It should be also taken into account the logistic aspect, with the afferent costs, when determining the areas implementation plan.
- CBA limits to the level of the distribution operator (DSO) although the positive effect could be extended to the system level, for example by implementing the incentive tariffs for peak-shaving, costs could be saved by new investments in expensive sources with quick start or expanding new network capacities. The major difficulty is the internalization of these costs/benefits in CBA analysis.
- The evolution of the SMS installation costs indicating the possibilities to equalize the costs for changing the existing meters in the network with the new SMS type, in the normal process of changing on expiry of the metrological term (8-10 years in Romania). This is a situation of the new consumers with new meters. This shows that technological change and the scale effect can become the decisive elements in less than 5 years, thus installing the

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new types of meters become a classical operation. It is true that this leads to overcoming the term of 2020 and it would be useful to examine that „phenomenon” called today SMS process is done by itself. Therefore, in this case it has to be decided if the roll-out have to be blended with the mandatory installation for the new consumers or with the metrological certification process.

### Bosnia-Herzegovina

There was a Pilot Project in the area of Brčko District, where there were registered 35,222 active customers in August 2015.

The JP “Komunalno Brčko ” d.o.o. company proposed a strategic plan for the installation of intelligent automated metering system for the period of 2015-2020 for the customers in the area of Brčko District with a goal to cover 80% (28651) of the end-customers. In the first phase of the Automated Metering Management (AMM) project Komunalno Brčko Company installed 3646 meters. Detailed technical parameters and system capabilities are explained in the reference [14].

5. Table: Strategic plan for deployment of intelligent metering system in 2015-2020 [14]

| Year | The annual plan of introducing intelligent metering system | The total number of end customers with intelligent metering systems | The total number of end customers without intelligent metering systems | The share of end customers with intelligent metering systems |
|------|------------------------------------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------|
| 2014 | -                                                          | -                                                                   | 35.814                                                                 | -                                                            |
| 2015 | 5.409                                                      | 5.409                                                               | 30.405                                                                 | 15,1%                                                        |
| 2016 | 6.000                                                      | 11.409                                                              | 24.405                                                                 | 31,86%                                                       |
| 2017 | 4.000                                                      | 15.409                                                              | 20.405                                                                 | 43%                                                          |
| 2018 | 4.000                                                      | 19.409                                                              | 16.405                                                                 | 54,2%                                                        |
| 2019 | 4.000                                                      | 23.409                                                              | 12.605                                                                 | 65,36%                                                       |
| 2020 | 5.242                                                      | 28.651                                                              | 7.163                                                                  | 80%                                                          |

The expected profit from the implementation of the next phase of the AMM project:

- reduction in energy losses (1% reduction gives an additional profit of approximately 220 000 BAM per year)
- reducing the number of employees for manual reading, (1,000 meters gives 1 employee less) total income per year 54.000 BAM
- reducing the number of employees for manual entering and processing data
- reduced the number of vehicles that are used for meter reading gives total profit of 10.000 BAM per year
- cost savings in enforced collection of receivables, the exclusion and complaints

One of the most important benefits of the project could be the creating of opportunities for system integration and remote reading water-meters, which is especially interesting for Komunalno Brčko. It reduces the need to use hand-held terminal for remote reading of water. Decreasing the cost of customer’s maintenance and servicing is also achievable. Time of delivering utility bills could be

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shortened which reduces costs and thus increase company profits. Real-time pricing would be a huge step forward as well as insight into the current state of spending through web. The ability to quickly detect faults in the network, integrating of AMM system with existing systems is also important from a technical viewpoint.

Implementation of the first phase AMM project was very successful and it created a solid foundation to continue and expand the project 2016 through 2020 with the final goal to cover at least 80% of end customers at the territory of the Brčko District of BiH.

Continuation of AMM system in the next phase will lead to:

- reallocation some of the employees working on manual reading and delivery bills for electricity to information and communication technology (ICT) business segment or distribution operators system as the system will get new and advanced features
- better and more regular monitoring of continuity of supply (SAIDI / SAIFI) as well as the quality parameters of supplied electricity, in accordance with EN 50160 Norm
- importance to the end user and the wider community, through reduction of losses and rational use of electricity by the end customers which ultimately leads to a reduction of environmental pollution and the cost of building new power generation, transmission and distribution facilities [14]

## Conclusion

The Directive on the internal markets 2009/72/EC [European Union 2009] encourages Member States to deploy Smart Grids and smart metering systems. Such deployment might be subject to long term CBA, as mentioned in the Directive.

With smart grids, the traditional passive distribution and one way communication and flow between suppliers and consumers is going to be replaced by active distribution that will transform the passive end users into an active player. In this new perspective, it is important to understand and involve consumers in order for them to fully understand the smart grid potential and consciously assume their role as active participants in the future electricity system. In the light of the above and of the growing interest of researchers and policy makers on the role that consumers will play, it is also important to consider the effects of “Smart Customer” projects on Smart Metering. [5][6]

According to the smart metering roll-out plans of the EU Member States, there is a clear evidence to benefit the electricity consumer by means of effective smart metering deployment and successful strategies for consumer's engagement. In particular, there are six ways the adoption of smart metering systems can benefit the electricity customer:



6. Figure: Classification of Smart Metering Benefits [5]

### Message to regulators

Regulation plays a major role in a smart metering roll-out. The regulatory authorities are one of the obvious parties (beside the Governments) to take up responsibility for the economic assessment and for devising a roll-out strategy, thus ensuring overall efficiency. Moreover, regulation needs to be carefully adjusted to the smart metering roll-out plans, firstly, to mitigate potential barriers to smart metering, and secondly, to create sufficient incentives for market parties to invest in and to use smart metering, thereby ensuring that prospected benefits can be realized. In particular, incorporating the efficient investment costs in the allowed revenue and the design of ‘new’ tariff schemes incentivizing consumers are essential to ensure maximal benefits from smart metering. In those countries where final consumption tariffs are still regulated, the regulator certainly has immediate influence on the promotion of such tariffs. But also in those countries where final

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consumption tariffs are not regulated, framework conditions regarding for instance the usage of standard load profiles need to be adjusted.

In order to avoid inefficiently high costs of a smart metering roll-out, a more gradual approach could be chosen, stretching the roll-out over time and allowing regional priorities to be set where considered necessary. Thus, stranded investment and peaking demand for resources can be reduced. However, costs and benefits of different approaches have to be assessed carefully during a comprehensive social cost-benefit analysis.

Smart metering is certainly an electricity topic but could also provide added value if applied to other utilities such as gas or district heat. An integrated and coordinated multi-utility approach when devising the deployment strategy could enable such extension to other utilities where an individual approach might fail due to the lack of a positive business case. Whereas a DSO led roll-out seems to be generally advantageous in a vertically integrated energy sector, a multi-utility approach might be better facilitated by a separate metering service provider. [1]

The Council of European Energy Regulators held a public consultation on the Energy Efficiency Directive and published a document which pertains to metering, billing information and cost of access to metering and billing information (reference [15]).

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