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ENERGY POLICY GROUP

The little smart-meter that could[1]

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August 2017

Although the smart meter (SM) technology was developed in the 1970s, the large-scale rollout of these devices (basically, an electronic meter that also monitors and records the energy consumption, while transmitting the data in almost real time to the utility company) took place only in the 2000s, following the cellphone networks' maturity in most of the developed countries. SMs bring measurable benefits to consumers, utility companies, and the energy system as a whole, as well as indirect environmental benefits through energy efficiency gains and system integration of renewable energy sources.

Smart meters in Europe and Romania

About a third of EU28+2's electricity users have a smart meter at present, out of a total of 283 million points of delivery, while the expectations are that the rollout will reach 60% by 2020 – below the aimed target of 80%.[2] The most active European countries in this respect are Italy, France, Spain and the UK. Significant efforts are also made in Austria and the Netherlands, while Ireland, Luxembourg and Norway are planning a major installation process. Sweden, Finland, Estonia and Denmark have already deployed SMs to most users. Outside the EU, Montenegro has already achieved a substantial rollout, while Serbia began an ambitious one in 2015.

In Italy, the rollout of a second generation of SMs is being prepared. As the previous program was implemented in the early 2000s, the first generation SMs is somewhat outdated and out of its technical lifespan. In Sweden, similarly, the deployment of a second generation SM is unfolding.

In Great Britain, 6 million SMs have been installed up to now, and the target is to deploy this technology in every home and small business by 2020. A recent survey, in which 90.000 customers were interviewed, shows that 81% of the users would recommend this technology to a friend, while the same percentage of people actually use less energy than before (mostly because 82% of the users have taken at least one step to reduce their energy usage). 87% of the users have mentioned they have a better understanding of their energy costs.

In Romania, the National Energy Regulation Agency (ANRE) has so far approved 36 SM pilot projects in 2015 and 2016 for all eight distribution areas, targeting approximately 270.000 points of delivery out of a total of 7.18 million, which means less than 4% of the population, at a cost of 107.715.463 RON (23.5 million

[1] "The Little Engine That Could" is an illustrated children's book that became widely known in the United States after publication in 1930 by Platt & Munk. The story is used to teach children the value of optimism and hard work.
[2] https://www.reportlinker.com/p04220211/Smart-Metering-in-Europe-12th-Edition.html

euros).[3] A rough calculation based on this figure indicates about 625 million euros needed for full implementation. This figure does not account for the expected cost-efficiency gains that come with full deployment: discount rates for SMs' procurement, decrease of technology costs over time, and competition between installation companies, which will push the costs down.

ANRE has prepared, in consultation with stakeholders, a National Implementation Plan for Smart Meters (NIPSM) in Romania. The agreed framework terms of the plan were repeatedly postponed. ANRE's most recent approach, laid out in an order proposal of April, is that NIPSM will be deployed in two stages: Stage I, from 2017 to 2020; and Stage II, from 2021 to 2026.

For Stage I, each regional distribution company is to install SMs for at least 30% of consumers, which is a considerable downgrade from the original 80% target. Moreover, ANRE will cap the investment value in the first year of Stage I to 10% of total investments approved for that year, and to 20% for the rest of the years of Stage I. For Stage II, a minimum of 80% of consumers are to get SMs at the end of the implementation period. The yearly value of SM investments, though, must not exceed 25% of the yearly investment plans of distribution companies approved by ANRE.

ANRE's 2016 report, issued a few weeks ago, mentions that given the testing period of merely 1,5 years, not all the benefits initially envisaged can be confirmed at this moment.

Smart Meters: Pros

Consumers have better control over their energy consumption and pay regularly for their actual consumption. A system that shows users at all times how much energy has been consumed since the last invoice, both in kWh and in RON, and that also displays the instant energy consumption is a powerful tool that helps them make informed decisions: switching to efficient appliances, turning off the ones not needed, or shifting energy demand to a timeframe of lower prices.

They can thus know in advance their invoice costs, and also better manage their personal cash flow. Instead of paying an approximate invoice and later having to pay a bigger bill, the SM technology enables them to adjust their payment to fully match monthly consumption.

Targeted products and services for customers. Having a much better understanding of its customers' energy consumption habits, a supplier will be able to better taylor its products and services. For instance, a customer with a substantial energy demand in a relatively small apartment might be just the right client for energy efficient products – e.g. efficient white appliances and modern and efficient lightening. Moreover, suppliers could offer customized tariff plans, based on the energy demand profile: lower prices for off-peak consumption, better weekend offers for vacation homes and the like.

This is advantageous to all parties: customers with smart and efficient household appliances; utility companies that can customize their energy products and services; appliance manufacturers,

[3] ANRE (2016), Raport Național, p. 194

with a growing market for energy efficient products; and also the energy system as a whole, with improved efficiency indicators, lower import dependence, and lower environmental externalities, to mention only of the most obvious gains.

SM is the foundation of other upcoming technology developments. Whether one talks about prosumers (i.e. consumer with installed PV systems able to inject the electricity surplus into the grid and be remunerated for it), energy storage and energy management (that is, the ability of consumers to store the energy surplus for later use of sale), demand-side response and the Internet of Things (i.e. a customer's possibility to optimize his/her energy consumption along the day using different price time-intervals or dynamic tariffs) or vehicle-to-grid (that is, using an electric vehicle as a storage asset) – none of these is technically feasible without a smart meter.

SMs are bidirectional (they also allow to measure the injection of electricity in the grid), can monitor and notify the consumer about the grid's status and about electricity prices, and can optimize the energy consumption of a household or business.

SMs facilitate the system integration of renewable sources. Reducing the need for peak generation, due to more efficient energy use and improved demand forecasts results in employing less of the old and inefficient power plants and even in rendering stranded some investment in new peak-demand capacities, which are typically energy inefficient. This greatly reduces GHG emissions and helps the transition to a cleaner environment in the decades to come. Besides, taking into account technological developments such as energy storage, demand-side response and energy management, the electricity system will become environmentally cleaner, while also benefitis consumers, be they households, small business or energy intensive plants.

Data security and privacy. Despite concerns regarding the privacy of data collected and transmitted by SMs, they in fact increase data privacy, as the information on the customer's energy consumption goes automatically to the utility company for billing purposes, thus avoiding a manual reading by a human operator. Meanwhile, of course, strict regulations must be put in place concerning the access to and protection of such data.

Protection of vulnerable consumers. As mentioned above, suppliers will be able to monitor the energy use of their customer base and make customized offers. In the example of a small flat with disproportionately large electricity consumption, demand spikes during cold spells allow the supplier to infer that this may be a vulnerable consumer using electric appliances to heat his home. Accordingly, the utility company will be able to offer social tariffs, specific services and financial terms for this category of customers, thus alleviating their vulnerable consumer situation.

Network tariffs will reflect the investment in digitalization. A reduction of the network tariffs will result from the elimination of manual reading by utility company employees, needed once a few months for every point of delivery to validate the actual figures of the analogue meters. Billing will be eliminated and customer care expenses will be lowered.

From a different perspective, considering the number of workers needed to implement a massive SM rollout, SMs stand for real mid-term job opportunities. On a longer term, maintenance and possible manufacturing of SM can grow into substantial economic activities, intertwined with the larger technological

complex of smart grids and other upcoming technologies.

Better forecast of energy consumption and energy losses. Based on historical data (with the newest records from the previous month), energy suppliers estimate their customers' consumption for the next day. A better demand forecast, hence a smaller estimation error, leads to lower costs for the company and better prices for its customers.

Not just suppliers, but also distribution companies buy energy from the market, because they must cover their energy loses – i.e. technical network losses and energy thefts – that are invoiced partly or entirely to the customers, based on the level of forecast error. A better forecast of such losses translates into lower tariffs for the consumers. A steady monitoring of consumption allows to immediately notice any anomaly or unusual demand spike, which may suggest an electricity theft. Moreover, based on historical consumption data, the supplier will be able, after dealing with those situations, to correctly reimburse the customers that have suffered unfair financial damage.

Faster outage detection and reduced failure times. Due to the continuous communication between the SM and the utility that operates it, any outage will be observed within seconds, which leads to faster reaction times. This technology also allows that some maintenance operations are done remotely, which translates into less repair time – no need for a field inspection to solve the technical problem – and smaller costs.

Smart Meters: Cons

Some argue that a massive SM rollout leads to a big increase of network tariffs in the following years. But this is not actually the case, for at least three main reasons.

First, Romania has undergone a tremendous, though maybe unnoticed, evolution of the main grid quality indicators over the past years (SAIDI and SAIFI, for instance), thanks to the investment financed by the customers through the network tariffs. Therefore, the investments yet to be done in this respect, though still considerable, are less than those already made. Importanly, though, instead of lowering the network tariffs, it is advisable to maintain them at the current level and direct more investment toward grid digitalization. The SM technology is the first step in this direction.

Second, not to invest properly in this basic digital technology would not only deprive us of the above-mentioned benefits, but it would also cause delays of all kinds and widen the technological gap between the Romanian grid and most other EU systems. Against such a background, trends like targeted products and services, prosumers, energy storage, predictive consumption and energy management, demand-side response or vehicle-to-grid will remain utterly out of reach.

Finally, the cumulated savings that utility companies will make out of the SM implementation (less energy bought to cover losses, efficient energy forecast, none or much lower reading costs, reduction of billing and customer care costs etc.) will sizably lower the final consumer's electricity spending.

Final point

It is important to point out that only by passing a critical threshold of customers with SMs can the rollout deliver truly substantial benefits. Otherwise, with isolated SMs or mere "islands" of consumers with high installation percentage, the distribution grids will be compelled to operate virtually unchanged.

For most Europeans, "the revolution will not be televised, it will be live". What about us?

Eating less fats at breakfast on weekends, for instance, will not help one lose weight. Likewise, merely adding one pilot project after another will not produce significant technology gains. This is basically the reason why the European Commission set the minimum target of 80% of consumers that should have this technology by 2020.

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