

SMART METERING - OPPORTUNITY OR THREAT TO THE POWER INDUSTRY?

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The power industry faces many major challenges in the coming years. The need of an expanded and strengthened power grid is a fact. New energy carriers are to be integrated in the power grid to satisfy international climate goals. The sector discusses smart grid, but what the concept actually is to contain is still out in the open. However, most of the players agree that smart metering is the technology of the future. In the course of the next few years automatic meters will be installed with most of the electricity customers.

INTRODUCTION

In Norway, the decision was made back in 2007 that smart metering is to be installed in all Norwegian homes by the end of 2015. The work is in progress, but what do the customers themselves think? Until now they have read their own meters and reported the meter level to the grid operator four to six times a year. In a few years everything will be done automatically. Consumers will also be offered other services related to the new technology. How will the customers receive these services? Will consumers be confident that the readings will be accurate? Are they willing to pay for the new technology, and will they be interested in using the additional services on offer?

The challenge regarding consumer attitudes and willingness to pay is one matter, but how will smart metering influence the grid operators' visibility and position in the market? There is a possibility that when the grid operators get their automatic meters in place, thereby removing the customers' need to read and report their measurements, the companies will become only one of many invisible providers of necessary goods, together with water companies and sanitation companies.

More than 40% of the Norwegian power customers report their readings through the energy companies' web pages. This gives the companies an unique opportunity to present their services to the customers. When there is no need to report the meter readings, how will the power companies communicate their products and services to the customers?

This paper will give answers to these questions based on surveys of Norwegian electricity customers' attitudes to smart metering and their interest in using the opportunities provided by this new technology. The survey was initially carried out in 2006, repeated in 2007, 2009 and in 2010. Its objective has been to determine electricity customers' changing attitudes to smart metering, their confidence in

its accuracy, their perception of this technology compared with current solutions, their willingness to pay, and whether hourly measurement would cause them to switch consumption to off-peak periods. In addition, we have explored electricity customers' interest in using associated services, such as electricity bill estimation for the current period, instant metering, comparison of electricity consumption with previous periods, and receiving messages online from the electricity provider.

Background

In 2007 the Minister of Petroleum and Energy gave the Norwegian Water Resources and Energy Directorate instructions to commence the introduction of smart metering to all Norwegian electricity customers. With this the grid operators are moving towards a major technological shift, perhaps one of the most extensive projects in the history of Norwegian grid operation. The companies have about five years to change more than two million meters.

Both electricity customers and grid operators will benefit from more accurate meter reading, continuous monitoring of consumption and simpler invoices. Smart metering will also let electricity customers access many new, advanced services. The Norwegian Water Resources and Energy Directorate estimates that the full roll-out will have a price tag of approximately EUR 0.6 billion and may be completed by the end of 2015.

The introduction of smart metering can be seen as a risky project for the Norwegian power industry, which has had two major reputation crises during the last seven years. If the sector fails with regard to the realization of the project, or by choosing faulty or the wrong kind of technology, one stands at risk of losing the trust and credibility that the sector has worked for many years to regain.

In Sweden the implementation of new meters started a few years back. Lately, there have been reports of some meters providing incorrect readings. Power customers have experienced invoices that are twice as large as those received before changing meters. A small number of AMR-meters have been given the leading role in a media struggle for the customers' trust. The experience from the Swedish market shows that the press are quick to criticize the new technology.

However, the Norwegian energy sector view the implementation of smart metering as a unique possibility to show their competence and ability to innovation, and as

a possibility to establish direct contact with the customers. More than 2 million households will be visited. All meters are assembled inside houses, and there has to be made appointments for the changing of each meter.

Present situation

Even though smart metering has had little publicity in Norway outside the power industry, the majority of the electricity customers (60%) are informed that the government has decided to change the meters in all Norwegian households. More accurate measurements and better control are the government's primary motives, according to the consumers. The greatest benefit for the customers themselves is that they no longer need to read and report the measurements to the grid operators.

However, the collection of measurement data has never been a problem in Norway. If we are to believe the Norwegian electricity customers, 84% read the meter and report the measurements to the grid company every time (72%) or almost every time (12%) they are required to. In addition, close to 30% of the power customers read the meter more often to monitor their own energy consumption. Indications point towards Norwegians having a special relationship to their meter, which has to be seen in relation to the high Norwegian power consumption compared with most countries. The average Norwegian household has a yearly consumption of between 20,000 kWh and 25,000 kWh.

Online reporting is the most frequently used channel of measurement reporting today. 42% of the electricity customers report their readings through the grid operator's web pages, while 34% report through an automated telephone service. Which channel the customer chooses is determined by age. 43% of the elderly prefer applying the telephone to report the measurements. The results must be seen in relation to Internet availability. Almost 85% of the Norwegian population has access to the Internet, while the share is slightly lower among those who have passed 65 years. Viewed over time, the share of consumers with access to the Internet is increasing. This leads to more electricity customers reporting their measurements through the companies' web-pages.

Even though the work with smart metering started several years ago, 11% of Norwegian households currently have the technology installed. Most of them (84%) are positive or very positive to be spared from reporting meter readings to the grid operator. By comparison 55% of those who do not have access to the technology view the arrangement in the same way. Even though the majority of the electricity customers are positive to not having to read and report measurements, many still prefer do it the old way: *"I want*

contact with and control over the fuse box myself," is a typical comment from this customer group.

Attitudes towards smart metering

Viewed over time, the greatest change in the attitudes is among those who do not have the technology installed. Among these, the share that views smart metering as positive increased from 44% in 2006 to 55% in 2010 (see figure 1). Among those with smart metering installed the share increase from 77% to 84% in the same period of time. This may indicate that positive experiences with smart metering have contributed to reducing scepticism among consumers. Those with high electricity consumption, (more than 25,000 kWh per year), are more positive towards smart metering. The explanation is probably the fact that automatic metering is more accurate, thus benefiting those with the highest consumption.

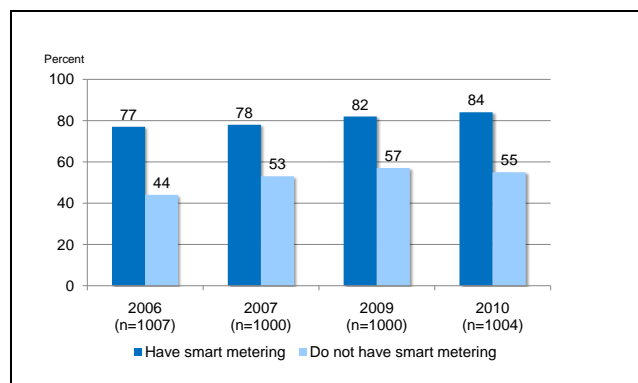


Figure 1: The share that states that they are positive towards smart metering split on those who have and not have smart metering.

Willingness to pay for smart metering

The Norwegian government has signaled that the costs of introducing smart metering will be financed through the grid fee. The customers' willingness to pay is, not surprisingly, very low, but it increases over time. In 2006 88% responded that they were not willing to pay to have the technology installed. *"The arrangement represents considerable savings for the electricity provider and should not cost consumers anything"*, *"The electricity provider will benefit the most because everything will be automated"*, *"Such services will save both parties a lot of trouble and customers should be saved from paying for it"*, were typical comments. Many consumers are of the opinion that the rationalization the grid operators achieve through smart metering and communication should automatically benefit the customers.

Following several estimates of the cost of the new technology, consumers were presented with a solution during interviews in 2007 where they would pay EUR 18

per year for a ten-year period. Faced with this scenario, the majority (68%) still responded that they were not willing to pay. When we asked the question again in 2009 and 2010, we registered a slight decline to 65%. Still only 33% of the electricity customers are willing to pay EUR 18 per year for a ten-year period to access the new technology. The willingness to pay is the same in 2010 as in 2009.

Confidence in the accuracy of smart metering

Confidence in the accuracy of smart metering is high. 83% of consumers are of the opinion that meter readings will be as good as or better than the current arrangement. The share increases from 78% in 2006. There are few (9%) who doubt the accuracy of the readings. These results are very satisfying, and show that there should be no problems with lack of trust in the new system in the coming years.

One of the main reasons to implement smart metering is to achieve more accurate measurements and precise readings – which will be profitable both for the consumers and the power companies. It is very important that the technology contributes to strengthening the quality of the readings, so that corrections can be avoided. If one has to return to the customer to acquire new measurements, this will increase the costs for the sector while diminishing the consumers' trust in the system.

Interest in altering behaviour

In the Norwegian power industry there is an ongoing discussion regarding the need of hourly measurement, and the government has yet to determine if this should be a requirement for the new technology. One of the motives for the implementation of smart metering is to make the consumers more aware of their own power consumption, and some claim that hourly measurements might stimulate the customers in this regard. In Norway, electricity prices are generally lower during the night and during weekends. But are the electricity customers willing to switch consumption to these off-peak periods, when the price is at its lowest?

There are relatively few consumers (29%) who consider it likely that they will change their consumption patterns. 38% considers it unlikely or very unlikely that they will change consumption to periods when prices are lower. The youngest consumers (below 30 years of age) are those who are least willing to change consumption patterns. Statements such as *"I can't be bothered to track electricity prices by the hour"*, *"To me it is completely idiotic to change consumption patterns to the time of day when prices are lower"*, *"I use electricity when I need it, regardless of what time it is"*, demonstrate that Norwegian electricity customers are accustomed to using electricity without considering price. The results match what we have seen in other surveys – most Norwegian electricity

customers (67%) feel they do enough to limit their own energy consumption. Over 30% state that if they should limit their consumption additionally, their way of life would also be confined. At the same time, numbers from Statistics Norway (SSB) show that the Norwegians' purchasing power has seen a significant increase (+30%) since 2003.

Interest in buying additional services

The technology behind smart metering will allow electricity providers to offer consumers several new products and services, but the interest is moderate. Less than 20% state that they are very interested in services such as viewing electricity consumption in real time, viewing the effect of turning electrical appliances on and off, making estimation of the next bill or receiving messages directly from the grid operator (see figure 2).

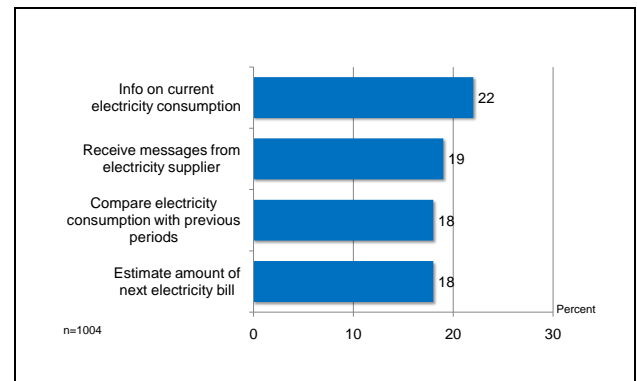


Figure 2: Percent of the consumers with considerable interest in additional services on offer.

We believe this is due to an immature market. The majority of respondents are positive towards the services, but very few display significant interest. Many fail to grasp the actual usefulness of the products they are queried about. One possible reason may be that the solutions are difficult to comprehend for those that do not have a special interest in new technology. Another reason is that automatic metering and the possibilities inherent in the technology have received little attention beyond the electricity industry. This is probably the reason why the market appears to be immature – a fact that represents considerable communication challenges for those who are going to provide the services.

Challenges for the power industry

The results also suggest that customers have problems distinguishing the new services offered through smart metering from current arrangements available in the market. Smart metering will for instance make it possible to compare electricity consumption with previous periods, but many customers already get this information through Internet based systems or as a graph on their invoice.

“This is not new. I have received consumption history via SMS, email, the internet and invoices for years”, several customers respond. Similarly, the new technology will facilitate automatic control of household electricity consumption, which is also to some degree possible today through thermostats, night mode on electrical heaters, and movement sensors turning on and off lights. Many consumers seem to believe that these demands are already met; and since they have problems seeing the need of such services via smart metering, they are also reluctant to pay for them. In order to make their value clearer to customers, it is very important to focus on how to distinguish partly similar products, particularly in terms of which positive features to emphasize.

The companies also need to settle on a suitable pricing strategy. Should the customer pay a one-time fee at the time of purchase, a one-time fee plus consumption charges, a fixed monthly price, or only for the actual usage? In Norway the experience so far is that many consumers are sceptical of accepting more monthly expenses.

The challenge regarding consumer attitudes and willingness to pay is one matter, but how will smart metering influence the grid operators' visibility and position in the market? There is a possibility that when the grid operators get their automatic meters in place, thereby removing the customers' need to read and report their measurements, the companies will become only one of many invisible providers of necessary goods, together with water companies and sanitation companies. 42% of the Norwegian power customers report their readings through the energy companies' web pages today. This gives the companies a unique opportunity to present their services to the customers. But 70% of them are of the opinion that they will not visit the company's website as often as now when they no longer need to report the meter readings. Almost 30% of the customers say that the commitment to the power supplier will be weakened after the implementation of smart metering.

Some grid companies do not view this as a threat for future customer relations; less customer contact equals less work. In today's society, with an increased focus on the customer and the customer's needs, this passive attitude towards the market is worrying. Treating customers this way will on the long term threaten both the individual company and the sector's overall trust and credibility. Viewed over time, smart metering will provide grid operators with an easier and more effective customer management. So it is important that the companies utilize the opportunities provided by the new technology to offer their customers new, value added services; services that can contribute to strengthen customer relations and make the customers feel that the power sector is making everyday life easier.

CONCLUSION

Over the next five years, smart metering will be installed with all Norwegian electricity customers. The Norwegian energy sector moves toward a significant technology shift, perhaps one of the most extensive projects in the history of Norwegian grid operation. The stakes are high, but with careful planning and good technology choices the project has good chances of success.

Even though only 11% of the country's households currently have smart metering installed, nearly 60% of all electricity customers are positive or very positive towards not having to read the meter themselves in the future, and the general trust in the new technology is high. Most customers (83%) are of the opinion that readings will be at least as accurate as manual readings. However, the willingness to pay for the new technology is very low, but it is increasing over time. Many consumers are of the opinion that the rationalization the grid operators achieve through smart metering and communication automatically should benefit the customers. This could make it difficult for suppliers to request payment for the services, and is a challenge the grid operators need to prepare themselves for.

It is highly uncertain whether the new technology would lead the electricity customers to switch consumption to off-peak periods, when the prices are lower. Norwegian consumers are used to low prices and want to use the power when they need it.

The interests in utilizing the services opened for by the new technology are moderate at the moment. In time, however, selling value added services might be a good opportunity for the grid operators to maintain and strengthen the customer relation. This is one way to avoid becoming one of the many invisible providers of necessary goods. A strong and distinct customer relation contributes to strengthening the individual company and the sector's reputation, and makes the customers feel that the power sector is making everyday life easier.

REFERENCES

- [1] TNS Gallup Energy Barometer 1997 - 2010