SMART ENERGY SYSTEMS FOR EMPOWERED CONSUMERS

Joint ANEC / BEUC position

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Executive Summary

The policy debate on changing energy systems has mainly been driven by industry so far and focused on technical requirements and functionality. Regrettably, little consideration has been given to consumer needs, expectations and acceptance although these are prerequisites to guarantee a successful take up of any new technology.

In this paper, ANEC and BEUC highlight the potential impacts of smart energy systems on consumers and stress the key consumer issues that should be taken into account in the changing energy environment. In particular, we call for:

- Ensuring that consumers fully benefit from smart energy systems, by fairly evaluating the costs and benefits of the systems without over-promising and by paying attention to the potential risks of the new technologies, especially for consumers in vulnerable circumstances.
- Implementing privacy by design to ensure privacy is build into the smart energy systems, implementing the principle of data minimisation, ensuring the safe disposal of data and the limitation of data retention.
- Empowering consumers by involving and informing them; ensuring the regulatory environment allows for innovations in the energy systems, especially towards saving energy, be it through better information or energy efficiency services and products. We are sceptical about demand response and time-of-use tariffs and about the applicability at residential level, even with electro-mobility at a large scale. Furthermore, some consumer groups might simply not be able to adapt their house / appliances in order to benefit from smart energy systems. These systems provide an opportunity to ensure better security of supply and new communication services, but regulatory measures, vested interest or legal obligations might make it difficult for consumers to be empowered and drive these changes.
- Guaranteeing a fair system of grid tariffs and easy to use technology for those consumers who also commit to producing energy. Furthermore, safe export of consumer generated green energy at a fair price ought to be ensured.
- Facilitating electro-mobility for interested consumers, while being clear on the overall environmental impact of the smart energy systems.
- Finally, implementing open standards and guaranteeing interoperability. Such standards should guarantee minimised consumer risks (e.g. in relation to remote switching or disconnection) and maximised benefits for all consumers.

Table of contents

1. A changing energy environment

1.1 The factors of change

In its work programme for 2010[1], the European Commission announced the publication of an Energy Infrastructure package and a forward-looking energy action plan until 2020. Moreover, a roadmap for a low carbon energy system will set out policy ideas until 2050. Smart energy systems will play an increasingly important role in these policy initiatives that reflect the important changes which have occurred during the past years in the European energy environment. But what exactly are these past and future changes?

First, there have been continuous changes in the energy markets. These changes were meant to allow and in some cases to force consumers to choose their energy providers. However these changes also exposed consumers to the need to be more attentive to mis-selling, to better understand what they are paying for and, in certain cases, to learn to work with the new metering devices.

Secondly, the "***20/20/20 objectives***" corresponding to 20% CO_2 emissions' reduction, 20% of the energy demand from renewable sources and 20% increase in energy efficiency by 2020, has impacted and will continue to impact on the energy environment. The most important challenge to reach the 20/20/20 objectives will be to replace fossil fuels with renewable energy sources, be it in power generation, heating or mobility. In the future, the electricity system will have to connect not only large scale wind generation and conventional power plants but also small solar panels from individual consumers and charging for electrical vehicles. Moreover, it is expected that peak demand will increase. Better and reliable information and appropriate tools will thus have to be developed in order to help consumers save energy and allow all of us to react to supply conditions, i.e. to take part in demand-response. The future energy systems should enable this transformation, from buffering peaks in production and demand through energy storage in the batteries of electrical cars, to putting in place the infrastructure to charge the cars, through to providing consumers with energy saving services and information.

Thirdly, other policy initiatives such as the ***Digital Agenda for Europe 2010-2015*** have an influence on the energy environment[2]. The Digital Agenda aims at providing all European citizens with high-speed Internet access, creating a single digital market, reinforcing online security and fostering research and innovation. It will be part of the recently launched

[1] Commission Communication "Commission Work Programme 2010 - Time to act" (COM(2010) 135 final)

[2] Commission Communication "A Digital Agenda for Europe" (COM(2010) 245)

general “Europe 2020 Strategy: A strategy for smart, sustainable and inclusive growth”[3] which should help pave the way for the recovery of the EU economy and put it back on the track of growth. The energy system will still be built of steel and copper, but with an additional ICT layer allowing management of the system functionalities as well as the consumer interfaces.

To respond to these changes, the Commission adopted a ***third Energy Package*** which will come into force in 2011. This package provides the legal basis for adapting the energy system through the implementation of smart metering and promotion of smart grids[4]. The Commission also set up a ***Smart Grid Task Force***, composed of the relevant stakeholders, including ANEC and BEUC, to identify strategic decisions and regulatory recommendations for implementation of smart grids.

As far as smart meters are concerned, Member States are required to analyse by 2011 whether the roll-out of smart meters is economically sound. Where the roll-out of smart meters yields a positive evaluation, Member States have to provide smart metering systems to at least 80% of those consumers who have been assessed positively by 2020 based on a cost-benefit analysis. In order to support such a roll-out, the European Commission asked for an open architecture for utility meters involving communication protocols to be developed[5]. The European Standards Organisations (ESOs) set up a ***Smart Meters Co-ordination Group (SM-CG)*** to execute this task, of which ANEC is a member.

1.2 Smart energy systems

The energy sector has to adapt to all the above changes. Energy systems thus need to be made more responsive, in one word, smarter. In this paper, we refer to ‘smart energy systems’ as systems encompassing both smart grids and smart metering.

Although no definition of ‘smart grids’ is provided by any regulatory text, smart grids can be considered as the application of ICT technologies to the management and use of electricity networks. A good definition of smart grids has been given by the European Technology Platform on Smart Grids as cited by the European Regulators groups (ERGEG):

> *“Smart Grid is an electricity network that can cost efficiently integrate the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to ensure economically efficient,*

[3] http://ec.europa.eu/eu2020/index_en.htm

[4] With the entry into force of Directive 2009/72/EC concerning common rules for the internal market in electricity adopted as part of the third Energy Package

[5] Standardisation Mandate M/441 on measuring instruments in order to develop open architecture for utility meters involving communication protocols

sustainable power system with low losses and high levels of quality and security of supply and safety."

Grid companies and their suppliers are expected to reap important benefits from the roll out of smart grids and meters such as a lower need for expansion of the grid, control of the load on the grid, control of the supply even in peak periods, easy read of, more precise information on consumption.

Smart metering on its own is in the first place a digital meter, which allows for feedback functions on energy consumption, automation and remote control and different pricing. The term 'smart metering' is not mentioned in any European directive or regulation, even though reference is made to 'intelligent reading of meters'. If well implemented the metering system also provides the possibility for consumers to get feedback on their energy consumption and in the longer term, possibly change their consumption pattern. As the European Regulators' Group for Electricity and Gas (ERGEG) wrote in a public consultation paper of December 2009[6]: *"Probably the most significant difference between today's networks and the smart grid of tomorrow will be seen at the customer/network interface. For the vast majority of customers connected today, no real-time information crosses this boundary. The network and the customer operate as independent entities exchanging only metering information for billing."*

Although one can be implemented without the other, smart grids and smart meters are closely related as smart metering enhances and enables a number of smart grid functions. However, smart grids encompass a much wider area of technologies and solutions compared with smart meters and are not restricted or strictly delimited by the introduction of smart metering.[7] For some of the functions a smart grid provides, a system of smart metering is not a prerequisite and vice versa. To clarify this last point with an example: Electro-mobility or small scale renewable electricity production already takes place without "smart meters". Nevertheless, the smart meters installed could also make it easier to measure the electricity consumption of the electric car and the production of the installation.

The scope of smart grids is currently limited to electricity, but the development of smart gas grids may need to be considered in the future. Smart metering is relevant to both gas and electricity, but the functionality of smart gas meters may be more limited. From a consumer point of view the smart meter is the device, which represents the connection to the smart energy system and the changes brought about by it in terms of smart grid functions.

[6] Position Paper on Smart Grids, An ERGEG Public Consultation Paper, December 2009
[7] *Ibid.*

2. Ensuring consumers fully benefit from smart energy systems

With the transition towards smart energy systems come new opportunities for EU citizens, but as with any new technology, increasingly sophisticated functionalities can result in unintended consequences. Great emphasis is given by European policy-makers to the need to implement more active transmission and distribution systems. Central to the future development of this smart energy system is nevertheless consumer acceptance through enhanced consumer protection and empowerment. Effective regulatory and policy measures to address personal data handling, safety and consumer protection are, in our views, still lacking. The use of new technologies shall enable all users of the network, including consumers, to actively participate in the internal energy market if they wish so, save energy and reduce or mitigate costs for energy.

2.1 Assessing the costs and benefits of smart energy systems

It is crucial to assess the costs and benefits of smart energy systems at the earliest stage possible. Moreover, the cost-benefit analysis should be carried out in a transparent manner and the results made public. The cost-benefit analysis should also cover the social and environmental impacts and the potential risks and benefits to consumers of the new technology. Regarding the financial costs incurred by consumers in relation to the development of the technology, we believe that national regulators and Member States should ensure that they are justified, transparent and fair. Of course, any savings to industry should also be passed on to consumers. It is indeed crucial to have a fair and equitable cost sharing mechanism by which those who benefit from the changes should logically pay for those benefits. Social and environmental benefits can be paid by all users proportionally through e.g. the network tariffs.

Against the cost of installing a smart electrical system are the expected efficiency gains[8], which in the long term will result in lower costs for the end-user compared to a scenario with the current changes but without smart energy systems. Overall though, it is expected that costs of energy will increase. In order to ensure the end-users nevertheless benefit from the efficiency gains, national regulatory authorities should take the mitigation of the cost increases into account when setting grid tariffs.

In the US, Commissioner Moeller from the FERC, the Federal Energy Regulatory Commission, warned in April 2010 against overpromising towards consumers:

[8] European SmartGrids Technology Platform Vision and Strategy for Europe's Electricity Networks of the Future, European Commission 2006

"However, the transformation [towards a smart grid] will not be immediate and will occur at varying paces throughout the nation. […] we at FERC also need to be aware not to overpromise the benefits of the smart grid to consumers lest there be a backlash that slows the pace of its implementation."[9]

2.2 Risks of new functions especially for vulnerable consumers

There are many different potential risks arising from new functionalities which in our view should be looked at and addressed to ensure all consumers fully benefit from smart energy systems. For instance, the following issues should be considered:

- Unsuitability of demand response for some categories of consumers
- Unfair or complicated tariffs (e.g. high prices compared to production costs at moments when consumers need electricity) because of market power or a lack of transparency
- Abuse by the energy provider or network operator of the remote control of smart appliances and of the smart meter
- Noisy or intrusive systems that interfere with other home networks.
- Impossibility to switch supplier (due to the technology, a long term contract with a supplier or lack of competition)
- Lack of clarity of consumer's liability

As we have said many times before, the case of vulnerable consumers deserves special attention. Energy is a basic need for all consumers, but vulnerable consumers are the ones likely to be confronted with difficulties in accessing energy. Unrelated to the ongoing changes, special attention should be paid to those consumers. As to new services, a study carried out by the British regulator Ofgem has identified that low income working households in particular may be adversely affected by new pricing practices as they are less able to adapt their house and behaviour or invest in smart appliances and are often forced to use it at peak times.

2.3 Privacy concerns and privacy by design

Consumer privacy, together with ensuring a fair division of the cost, is without doubt one of the most important aspects of the change towards smart energy systems. Data access and ownership, permission to gather data and the optimum frequency of data are all issues to carefully consider and address. Furthermore, consumers should have confidence that their metering system will not be tampered with or hacked into – ensuring that their bills are accurate, supply is maintained and personal information is

[9] Testimony of Commissioner Philip D. Moeller Federal Energy Regulatory Commission before the United States Senate Committee on Energy and Natural Resources April 27, 2010

secure. Smart meters and grids must be safe from infection by viruses and malware.

Privacy should be designed into smart meter systems right from the start as part of the compliance life-cycle and include easy to use privacy-enhancing technologies. We urge to make the principle of privacy by design mandatory, including principles of data minimization and data deleting.

Such a proposal is in line with the Data Protection Directive. It emphasises the importance of taking appropriate technical and organisational measures both at the time of the design of the processing system and at the time of the processing itself[10]. Where a security breach does occur, e.g. where data has been copied or altered by an unauthorised third party, a mechanism should be foreseen to inform the affected consumer where necessary and steps taken to rectify the situation. Moreover, if a consumer consequently suffers damage, the company responsible should be held liable and thus should compensate the consumer. The burden of proof and the responsibility to produce relevant documentation should be held by the professional[11].

2.4 Empowering consumers

Empowerment is crucial if we are to ensure the success of smart energy systems. On the one hand, it means informing consumers; on the other hand, it means creating chances and space so that consumers can benefit from the new communications tools and possibilities of the smarter energy systems.

Involve consumers

It is crucial to communicate towards consumers so as to ensure they understand the ongoing changes and feel part of the development. For instance, consumers should be informed about time-of-use tariffs, environmental aspects, the protection of privacy and the role of new players in the market[12]. If consumers do not perceive the added value of the technological changes, or if they feel the demand management envisaged is intrusive, they will resist the changes. In Victoria, Australia, the roll-out of smart meters was halted over doubts about costs and the disproportionate burden of time-of-use tariffs on less affluent and less informed consumers.[13]

[10] Article 17 and Recital 46 of Directive 95/46/EC
[11] ANEC/BEUC position "Consumers' scenarios for a RFID policy"
[12] VZBV Study „Erfolgsfaktoren von Smart Metering aus Verbrauchersicht", 12 May 2010 (n0410/23166 Hy/Bü)
[13] http://www.theage.com.au/victoria/plug-pulled-on-smart-meter-plan-20100322-qrdc.html

Facilitate the transition towards innovative energy services

Consumers should be empowered to change their consumption patterns and reduce energy consumption. Smart metering[14] in particular could contribute to empower consumers by providing them with the information they need, in a usable and understandable format, to realise benefits through making more informed choices, such as changing consumption patterns and reducing consumption. Consumers should also be able to easily change supplier. These new possibilities offered to consumers will help them benefit from lower prices and additional services. Accountability of energy companies through better measurement of quality of supply and supply outages should also be made easy for consumers to claim compensation for failures. Finally, functionalities ought to be developed to support future developments in the energy market (e.g. purchase from more than one supplier or automatic selection of the lowest available tariff). All these requests are in line with the obligations of national regulatory authorities as stated in the new energy directives[15].

An important part of the "smartness" of the energy systems should be to allow consumers to choose to manage their energy automatically. It is far from realistic to assume that all consumers will manually control their appliances once they have received the appropriate information or be able to process and use all the available information. Changes in the legal frameworks and practices should allow for the creation of an energy efficiency product and services market. Through demand side measures like subsidies or tax breaks consumers will be empowered to purchase this services and products

Important doubts about demand response and time-of-use tariffs

Renewable energy sources are volatile by nature as opposed to the traditional energy sources like nuclear, coal or gas. As decided in the EU Renewable Energy Directive, the share of renewable energy has to increase by 20% by 2020. As such, the volatility in the production side will thus increase. While additional large scale storage will limit the volatility, demand can buffer this volatility through demand response systems. Consumers, or appliances at the consumer side, should thus reduce or increase their consumption based on load conditions. Furthermore, the demand side itself can limit the peaks avoiding building extra peak-production. However, in order for demand response to work, it should be able to adapt in (almost) real time and at a large scale. We doubt that overall consumers are capable of disposing of sufficiently large volumes, as households' use energy when they need it. Efficient electric heating and electrical storage water heaters

[14] BEUC position "Less consumption and a better working energy market: realizing the benefits for smart metering for consumers" (x/064/2009)

[15] Art 36 of Directive 2009/72/EC concerning common rules for the internal market in electricity

use important amount of electricity which is less time-bound, but these appliances are becoming more and more efficient. As to electro-mobility, the batteries could be used to store electricity or the charging moment can be determined with some flexibility allowing demand response. As with the other consumer related goods, we have our doubts as charging and discharging batteries involves cost because it reduces the life time of already expensive car batteries. Moreover consumers are less likely to participate in demand response schemes on an individual basis.

We would also like to draw attention to the fact that energy is and should remain a basic need. Demand response should thus not endanger the consumers' freedom to use the electricity at the moment they need it, at a reasonable cost. Private energy consumption patterns could be guided towards energy efficiency but not decided by producers, energy suppliers or grid operators.

Companies or authorities who bring together consumers and negotiate and interact with other companies or authorities (so-called aggregators) could play a role by facilitating demand response. In our view, there is scope for the development of a market for these services to the network to be developed, but they should be kept simple and easy to use for consumers. Although demand-side participation can be realised without smart metering, one of the elements of simplicity is to have the demand side features as standard in the smart metering architecture when it is rolled out.

Guarantee continuity of supply

When a grid is overloaded or multiple failures like short circuits occur, it is customary to disconnect some receivers to create 'islands' with functioning electrical power supply. Smart energy systems will provide an enhanced flexibility allowing for more control options for the network operator such as the isolation of parts of the network from the rest.

In this context, when planning islanding for emergency situations in smart grids, we consider all measures should be taken so as to avoid interruption of supply first to hospitals or social service institutions where human lives can be endangered and secondly in residential areas.

The smart electrical system as a communication tool

Through the extra communication layer, remotely configurable periods during which the consumer can not be disconnected could be communicated towards the meter. During those times, energy is supplied regardless of credit balances. Such "non-disconnection" periods will be time bound, with a start and finish time and may also be configured to cover a specific date or day of the week.

At the same time, opportunities around delivering tele-care services to vulnerable consumers also need to be explored to ensure that they are not

missed. For example, warnings if the temperature in the home falls below a certain level, or if an elderly person has not turned on the kettle in the morning, could send an alarm to carers.

The necessary provisions and tools should be available to ensure these options can be developed. In the US, some electricity companies have begun providing internet services over their communications systems[16] and it is expected that telecommunication companies will also provide energy services at a later stage. The same is likely to happen in the EU in the future. One of the questions will thus be which body regulates the providers who wish to develop new types of services. There will also be questions around licensing or consumer protection.

2.5 Consumer as producer

Distributed generation should and will increase in the near future and more and more consumers will install micro-generation. It is thus crucial that the installation or running of micro-generation does not require the installation/switching of additional meters. In addition, when developing new grid charging methods, small scale producers should not be disadvantaged. Volume-based methods do not stimulate energy savings.

This increase of micro-generation power may lead to network overload increases and the risk for consumers' individual installations to be switched off more often. It is therefore key for distribution system operators (DSOs), today responsible for the voltage quality and balancing of networks, to start shifting from distributing power on a top-down basis to enabling more distributed generation. DSOs have to take up a role in which keeping up voltage quality and balance will be central and ensure that electricity flows equally in both directions. At the same time, new players, like aggregators have to bundle several individual consumers and trade electricity and auxiliary services like balancing on the energy markets.

In the above context, grid access tariffs at a fixed amount will have to be abandoned as they clearly disadvantage small producers like consumers. Grid tariffs solely based on transported power should also be changed as they do not stimulate energy savings and as such, make the transition towards a new model of energy markets more difficult. Finally safe export of consumer generated green energy at a fair price ought to be ensured.

[16] Smart grids and the new utility A Maravedis study in conjunction with the University of Maryland University College June 2010

2.6 Electric mobility

Changing to electro-mobility will logically imply changing petrol stations into "electric-charging points", as well as the development of new charging points. At the same time, most petrol consumed will be replaced by electricity, increasing the demand for electricity. These changes will imply important changes in the networks. Although still very expensive and impractical for most consumers, electric cars are said to be efficient and able to provide demand response. Electro mobility systems also offer the possibility to store electric energy on a much larger scale. In return, the development of smart metering inside electric vehicles could provide consumers with reliable and real time information allowing them to decide when and how it is best to charge their cars, whether it be at home or at charging stations.

However, the energy source used for charging electric cars is crucial: if fossil fuels are used for electricity generation, using an electric car will hardly make a difference to the environment compared with using a car running on petrol. We therefore believe more discussion around electro mobility is needed before electric cars are promoted against other more ecological transport technologies and before smart grids are developed with this objective in mind.

2.7 Environmental impacts

We consider it necessary to reduce the environmental impacts of technological change: materials and lifecycle costs should be checked prior to deciding on the roll out. An important element to consider is the energy consumption of new technology. We therefore call for ecodesign requirements for smart meters to be developed.

2.8 Open standards

Open standards and interoperability are the driving forces for good implementation and thus the cornerstone for all the above. ANEC and BEUC therefore support the elaboration of standards to underpin present and future regulatory requirements on Smart Grids and Smart Meters. These standards, as with all standards related to public interest issues, must be developed with full and effective consumer participation.

We believe standardisation work in the area of smart energy systems should address the minimisation of potential consumers risks (e.g. remote switching or disconnection; confusing tariffs schemes; disclosure of personal data) as well as the maximisation of potential benefits for all consumers (e.g. through lower energy prices and lower CO_2 emissions). Consumers must have the freedom to chose how the new technology is used (e.g. whether to have a smart display or to receive the information in other ways, whether to accept

the standard display or upgrade to more sophisticated equipment, where the meter/display is located etc.).

In this context, special attention needs to be given to consumers in vulnerable circumstances which should not be disadvantaged by any new technology. In the case of smart energy systems, it need to be ensured that all displays and communications are tested by consumers with disabilities, that all consumers in vulnerable circumstances are not excluded from benefits available to other consumers, etc. In particular, compliance with CEN/CENELEC Guide 6 on addressing the needs of older persons and persons with disabilities[17] in standardisation should be guaranteed and the testing of displays and communications should be performed by consumers with sensory impairments.

Finally, we call for standards to be widely available to all interested parties and for them not to be used as a means of market segmentation. Therefore, standards should either be free of Intellectual Property Rights concerns, or licensable on a fair, reasonable and non-discriminatory basis (FRAND)[18]

2.9 Delivering consumer requirements

The consumer requirements identified in this paper will need to be delivered through a range of measures, including:

- Regulatory measures
- Amendments to provisions in existing standards
- Widening the scope of standards to address new issues that arise because of the new technology
- Agreement with the industry on consumer information requirements
- Information campaigns towards consumers

END

[17] CEN/CENELEC Guide 6 “Guidelines for standards developers to address the needs of older persons and persons with disabilities”

[18] ANEC position on European Commission White Paper “Modernising ICT standardisation in the EU: The way forward” (ANEC-ICT-2009-G-040)