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New Energy Demand Programs Acceptance - a Study of Residential Customers in Central Poland

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Abstract

Energy market is changing from a central to a dispersed model of energy supply. All the energy market customers, including households, will have to deal with changing energy prices and they are expected to be more active in their energy usage and management. This demands new services and more information to be offered by energy supplier. Technology change gives now an opportunity to create new solutions, but the important problem to solve is how to find out customers' expectations and needs. Besides the theoretical background on customer changing behavior regarding energy consumption, the paper presents the result of a survey conducted in April and May 2013 in Central Poland. The main objective of the study was to find out a current attitude of Polish residential customers towards new energy demand programs and active energy market participation. For the purpose of the study, a questionnaire was developed.

In general, survey results show that customers are interested in Smart Grid solutions, the majority of them accept the installation of smart devices operated automatically, and they are ready to play an active role in the energy market. The research confirms that consumers are willing to take part in Demand Side Management (DSM) programs in order to save money and are open to socially responsible behavior. The results also show that saving money and reducing energy usage are not sufficient motivators for the customers, they expect some additional values added to new DSM programs. Therefore, a new approach to get residential customers involved in new energy demand programs is proposed and the idea of a new model of supplier – customer relationships is presented.

***Keywords*: Smart Grid, energy demand, Demand Side Management, Demand Side Response, customer engagement.**

Introduction

Greater energy efficiency is an essential part of overcoming the challenges facing the energy sector in the process of changing from a central to a dispersed model of energy supply. More energy is expected to come from Renewable Resources (RES) and Dispersed Energy Resources (DER) in order to reduce dependency on fossil fuels. Small producers will be able to meet a part of energy demand on the market. The coming generation of a power network called the Smart Grid (SG) changes the role of energy customers giving them possibility to make informed decisions about their energy consumption and to decide not only how to use energy, but also when to produce and sell it. The contribution of electricity produced from renewable energy in gross electricity consumption has been growing. According to a 2009/28/EC Directive, each EU Member State shall ensure that by 2020 the share of energy from renewable sources in gross final energy consumption is at least its national overall target for the share of energy from renewable sources in a given year, as specified in the directive. For Poland this goal was set at 15 %.

Fast new technology development of DER together with ICT technology is a key element of wide SG deployment. The prices of new technologies are decreasing every year, small energy consumers can invest in DER technology and trade their own generation or storage capacities. Many research projects aim at successful prediction of a critical price level at which customers will start to invest in such technologies (Gangale et al., 2013). The biggest investments now are concentrated on making consumers manage energy usage in an effective and active way by enabling smart metering and home management technologies and services.

The results of several studies conducted by different organizations show that the level of residential customers' knowledge, understanding of the problem, and engagement in new energy demand programs is rather low and vary across geographic location (Accenture, 2010; IBM, 2011). It must be noted that the analysis of the residential customers energy profiles shows differences in energy usage even within the group of similar houses equipped with comparable facilities (Zhang et al., 2012).

The main objective of the conducted study was to find out the current stage of Polish residential customers' attitude towards new Demand Side energy (DSM) programs and active energy market participation. The paper presents the main results of the study.

Demand Side Management

Demand Side Management allows energy distributors to manage their customer energy usage by offering different programs and incentives that attract customers to lower energy usage. Instead of setting up new energy generators in order to satisfy growing energy consumption, distributors can reduce customer demand on certain days or parts of the days. A DSM mechanism can be described as all types of initiatives that help override different types of barriers and allow to achieve energy policy targets. Those mechanisms are dedicated to the organizations that create and offer special programs to customers (Crossley et al., 2000). DSM programs can be described as projects and actions derived by particular organizations that aim at lowering energy consumption in energy consumer groups leading to long time energy behavior change. The DSM idea is not new for the energy utilities. Special programs were offered to reduce demand during peak periods and helped manage grid operation, but the group targeted was mainly industrial and commercial customers, with a few residential customers who were offered tariff – systems with lower energy prices on some periods (mainly at night). Three main groups of incentives supporting DSM can be described, such as (Aghaei and Alizadeh, 2013):

- driven by market and economic factors – aiming at cost reduction of energy delivery and maintaining the necessary reserve capacity as well as lower price fluctuation in response to Demand Side Response programs,
- driven by environmental factors – leading to better energy efficiency and lower CO_2 emissions,
- driven by grid stability – ensuring system reliability by reducing the demand for specific, usually short periods of time, and reducing the need for additional generation and transmission of energy.

The following main instruments are used in order to achieve DSM strategic goals and objectives:

- Load Management (LM) – short term energy demand reduction mainly in pick periods and/or moving the energy demand to other, pick-off periods. This type of programs requires fast communication technology and direct control of energy appliances;
- Energy Efficiency Programs (EE) – long term energy usage reduction as a result of installing energy efficiency equipment and solutions;
- Energy Conservation (EC) – promotion of energy friendly behavior leading to reduction in energy demand;
- Demand Side Response (DSR) – active customer reaction to incentive signal received from energy distributor.

Energy customers are expected to change their behavior and pay for the products and services offered by Smart Grid that are valuable for them in terms of financial, environmental gains, or others. For a particular residential customer, the effect will depend on several circumstances. Although financial incentives play the most important role, the influence of other factors connected with other roles played by the customers as community members are also very important (Timermann, 2012). Designing a new DSM program for residential energy management, energy distributors must consider several issues affecting customer decisions, such as (Pamula, 2013):

- habits, beliefs, motivation, and curiosity about new technologies,
- local society pressure and status in the society,
- the level of engagement in environmental protection,
- the ability to reduce energy consumption and take Demand Response action,
- the level of commitment in investing in DER facilities,
- the attitudes to operating DER facilities,
- the level of RES installed in local community.

As an important element for the future SG prosumers, the ability to control energy production and consumption in response to incentives, mainly market signals will be crucial for any price setting mechanism. The level of this response and the degree of those incentives should be explored through researches done on local markets.

The DSM program assessment is usually provided based on economic and cost analysis. The program is effective if it reduces energy consumption and is profitable if its cost is lower than profits gathered from energy reduction. The important thing is that the DSM program assessment should also consider the influence of programs on permanent change of energy related behavior leading to further activity of customers on the energy market. There is no single golden rule for the success of DSM programs. Success depends on many factors that influence each other; even the entering program can change existing relations, so the most important thing is to consider the whole context of the change process (Breukers et al., 2011) and to find some new measures of DSM programs evaluations which will account for the process of social learning.

Customer knowledge and energy demand program acceptance

Successful introduction of new technology and application of a SG vision in practice means not only inventing new appliances, equipment, and solutions design, but, first of all, launching them on the market and ensuring wide customer acceptance. It means preparing new infrastructure, new procedures and preparing users for a new technology. In the case of introducing RES technology, an important problem to solve is the local infrastructure technology and local acceptance of presented solutions influencing local economy as well as the acceptance of a wider social view. For the socio-technical progress the relation between the implemented models and surrounding objects (such as users, consumers, stakeholders) is essential. Those objects can play different roles designed by the authors of models or created by themselves (Walker and Cass, 2007).

A very important role in new energy behavior is assigned to communication systems between customer and an energy services provider. The importance of feedback on customer actions seems to be an essential part of the engagement process in new energy demand programs. The role of communication was investigated mainly in the field of psychology and social sciences (Darby, 2006), considering technical and economic aspects (Pyrko and Noren, 1998). Making an assumption that customers behave in a rational way, the current analysis considers two main factors underlying the process of information analysis and decision making on the level of individual customer: an economic and a psychological one.

Decision making factors for customers can differ but, in general, to take actions customers need (Roberts and Baker, 2003):

- relevant and engaging feedback,
- motivating justification for action (in most cases people do not want to pay more than they should or than other customers pay),
- a call to action,
- some advice.

Feedback information can be more effective by using different types of techniques, such as short billing cycle and presenting information in a graphic form on traditional paper invoice or in an electronic way via smart meters or a specialized website. A better feedback can cause energy savings between 5–10 % (Roberts and Baker, 2003). To be effective, a feedback on energy related behavior should support a customer with (Roberts and Baker, 2003):

- historical comparison of energy usage, actions, and results,
- normative comparison with similar houses or values used as a standard of a given customer profile (type of benchmarking) or comparison with target % reduction in consumption,
- an offer of assistance to understand the increase, if the customer bill rises continuously,
- free advice on energy management.

On the one hand, consumers tend to have a rather vague understanding of environmental benefits of reducing energy consumption. They only understand basic measures, such as better house insulation or temperature and lighting use reduction that may have an impact on environment. On the other hand, it seems, they lack motivation to act due to a lack of financial support and conviction that an individual initiative can do little, if anything, against global environmental problems (Roberts and Baker, 2003).

An important contradiction between consumer's perceptions and his/her knowledge of new solutions offered by energy distributors can be observed. In order to develop a new DSM program widely accepted by customers, several questions must be answered (Accenture, 2012). The first important issue to be clarified is if consumers want to optimize their energy consumption or if they feel some kind of pressure (e.g. social) to do that. The second problem is if they know how to use energy in an efficient way, and what actions can be taken in order to optimize energy consumption. Customer engagement into new DSM programs depends on his/her own preferences, attitudes, and needs to be enhanced by consumer centered strategies. Research must be conducted to find out if consumers understand the impact of electricity usage on the environment, and if they recognize it as a crucial issue – what facts they are aware of and what kind of incentives and barriers for adoption of new DSM programs can be identified on the local market.

Research methodology

The anticipated massive scale of energy production by customers (so far, consumers of energy) demands new incentives and wide activity projects on the acceptance of new options. The main objective of the survey was to find out what the knowledge and perception of Lodz Region energy consumers is regarding Smart Grid Solutions enabling them to play a more active role on the energy market. For the purpose of the study, a questionnaire was developed, based on literature review and surveys on results of projects published by different research organizations and consulting companies. The questions covered important aspects of electricity supply, customers' assessment of the performance of the existing relation with the utility as well as the acceptance and expectations of the new smart grid solutions. A part of the questionnaire was dedicated to customers' energy related behavior and socio-demographic characteristics. Additional questions were included for a small group of respondents of chosen local communities to find out their attitude towards establishing local groups of active prosumers. After a preliminary study done in September 2012, it was decided to carry out the research by direct survey, in the form of a paper questionnaire to be filled out in the presence of the interviewer. This form was employed in order to provide high quality and reliability of a complete questionnaire. Interviewers (students of the Faculty of Management, the University of Lodz) were trained to encourage respondents to answer questions and provide explanations to any doubts. The survey was conducted in April and May 2013 in Central Poland – Lodz region. The Residents of Lodz region live mainly in single – family and multi – family houses, so the main criterion for respondents' selection was the division of the respondents into living in households located in standalone houses and blocks of flats. All the citizens – residential customers could enter DSM programs, so 50 % of questionnaires were prepared for the house owners living in their houses and 50 % for the households in multi – family buildings. Out of the total 600 questionnaires, 50 % were conducted in the city of Lodz and other studies were conducted in smaller cities and towns of the region. As the sampling method was adopted (not probabilistic), the variables independent tests were not created. Of 600 completed questionnaires, 271 properly completed ones were received from the city of Lodz, and 167 from other parts of the region.

The development of SG in Lodz Region is very limited. Currently, there is not a single operating pilot solution for testing the operation of the local energy market, so there is no possibility of research, based on the

actual experiences of residential customers. Research investigating the main factors changing the customer role in the energy market into an active prosumer was conducted as a test to check a current attitude of consumers in respect to such solutions. That is why this study was conducted on a selected group (chosen on subjective evaluation, after a local area community investigation), which is supposed to be a potential community of prosumers.

The data collected were entered into a spreadsheet model supported by a validity checking mechanism in order to avoid errors. Each questionnaire was checked for formal, accounting, and logical consistency. Further data analysis was prepared using spreadsheet functionality.

The sampling method used carried a number of limitations. The results are not representative and cannot be generalized to the entire population and residents of Lodz Region. However, due to the fact that it is quite a large number of completed questionnaires, valuable empirical data have been obtained showing household preparation to introducing new solutions of active participation in the energy market. From the research point of view, it was important to prepare a study which would allow the identification of the key factors for accepting Smart Grid solutions in the studied group. The collected data and analysis are therefore valuable for creating a model of customer engagement in new ways of energy management.

Polish residential customers SG solutions and DSM programs acceptance

One of the main objectives of the study was to evaluate residential customers' readiness for the introduction of new energy demand solutions. The analysis of current customer activity in energy efficiency and energy conservation has been completed. Almost the entire group of respondents (94,06 %) takes some action to save energy. 15,7 % of respondents undertake one type of action, 20,32 % – two types, 36,3 % – 17,4 % three – four types of action. More than four types of activities are undertaken by 11,2 % of respondents. The most often undertaken actions are: switching off unnecessary lighting, using energy saving bulbs, and buying energy – efficient appliances (47 % of respondents said they buy such devices).

Other activities that the respondents have taken, listed below, may be considered as ones that might qualify a customer to participate in Demand Side Response (DSR) programs: more than 40 % of the respondents completely switch off unused home devices, more than 18 % avoid simultaneous use of high power consumption equipment, more than 12 % reduce the use of high energy consumption appliances. The results of a national survey conducted in Poland by ATKearney consulting company (ATKearney, 2013) have shown that only 1 % of Polish residential consumers use two-zone tariffs. The result of the studied group was more than 9,5 %, and that shows a great potential for the introduction of Time-of-Use (TOU) tariffs in the local community.

In the group of respondents actively involved in the management of energy consumption the following tendencies have been observed: more than 9 % changed their energy supplier, and about 3,5 % said they intend to. It can be assumed that the demonstrated activity of customers can be transferred to energy market activity and thus may mean changing the role of those customers in the energy market into active prosumers.

A part of the survey was designed to find out how customers evaluate potential advantages and potential threats coming from new SG solutions. The examination was done using a 5 – point Likert scale: 'yes', 'probably yes', 'no', 'probably not' and 'no opinion'. The first part concerned the perception of potential benefits of implementing new solutions. More than 50 % of the responders have shown 'no opinion' and a small number of responders have left this question unanswered. This means that the actual knowledge about possible SG solutions is quite low, and new educational programs are necessary for wide deployment of new energy management solutions. The largest group of consumers, more than 50 %, have shown the ability to accurately track the energy consumption (and therefore energy saving) as a perceived benefit that confirms the importance of communication and energy action feedback as an essential part of the customer change of energy related behavior.

Table 1

The acceptance for SG benefits based on survey results

Potential SG benefit	Positive attitude
Ability to accurately track the energy consumption	51,8%
Increase energy efficiency	47,0%
Helps to satisfy the growing energy demand	41,3%
Eliminate human energy meters readings	39,7%
Lower CO2 emissions – environmental friendly solutions	38,1%
Give the possibility to choose tariffs scheme	37,9%
Provides better energy supply, minimize blackouts	34,2%
Offer easy new RES adoption	31,5%
Generate new jobs	31,1%
Offer greater energy supplier choice	29,7%
Decrease necessity of big traditional plants investments	26,3%
Give the possibility to active participation in energy market	24,2%
Decreases necessity of nuclear plants investments	18,0%

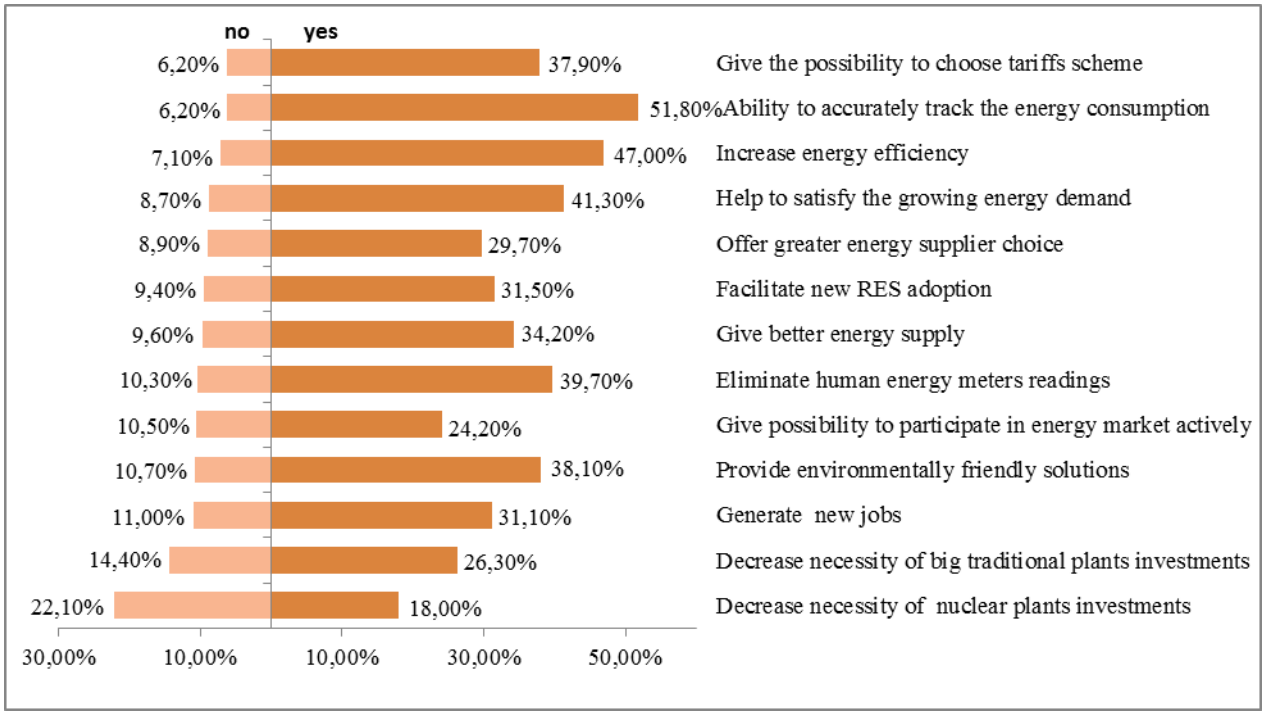

Figure 1. Respondents' evaluation of potential SG benefits, based on survey results

Of the remaining group, the respondents have expressed the appreciation of the following benefits: increased energy efficiency – about 47 % and meeting a growing energy demand – more than 41 %. The main results of the problem analysis are presented in Table 1. As it can be observed, ecology and environmental protection issues are in the fifth position. The respondents do not perceive the development of smart grids as an alternative to the construction of nuclear power plants (the last place on the list in Table 1) and traditional power plants (10^{th} position). Total positive (cumulative answer 'yes' or 'probably yes') and negative (cumulative answer 'no' and 'probably not') of the benefits listed in the survey is shown in Figure 1.

To determine respondents' perception of potential threats arising from the use of SG solutions, the same Likert scale was used. As with the assessment of the advantages of SG, more than 53 % of respondents have expressed 'no opinion' on the subject, and a few of them have left questions unanswered. The respondents are most concerned that the energy suppliers would benefit more than customers – more than 32 %; afraid of higher costs – more than 28 % and of the necessity to change energy related habits – more than 29 %. However, more than 6 % of the respondents have expressed readiness to change daily habits associated with energy usage to reduce the bill. In the literature considering first SG pilot projects, there have been reports of strong public resistance to changes and smart meters installations. Public protests, in which new energy meters were blamed for causing serious diseases such as cancer and headaches, were registered, (Ngaryin et al., 2012). In 2009, in Bakersflield, California, and Texas (USA) smart meters were pointed out as the reason for the huge increases in customer energy bills.

In contrast to many customers in the world, local respondents do not see the smart meters as health risks. They see a risk in cyber attacks – almost 24 %, and in violation of the privacy rights – more than 24 %. The main results of the problem analysis are presented in Table 2. The assessment of potential SG risks by respondents of important (cumulative answer 'yes' or 'probably yes') and less important (cumulative 'no' and 'probably no') is illustrated in Figure 2.

The Demand Side Management programs are one of the key components of smart grid technologies. The presented results are very important factors determining customers Demand Side Response (DSR) programs activity. Respondents' preferences concerning DSR programs have also been investigated in the survey.

A primary factor motivating consumers to take part in DSM programs is a financial factor. Expectations for the program are very high among the respondents. More than 84 % of respondents expect cost reductions of over 15 %. High expectations have been expressed by the respondents whose average energy bills are less than 5 % of the total home expenditure (about 45 % of respondents). The results of different projects presented in literature show that, for some customers, environment preservation aspects are one of the main criteria of taking part in the Demand Side Response (DSR) programs and Energy Efficiency programs. For the survey respondents, those problems have been put in the fifth place. More than 83 % of respondents express support of environmental preservation related initiatives.

While introducing a new DSR program, those consumers should be a potential group that can be targeted by programs in which the advertising campaign emphasizes the importance of changing customer behavior to preserve the environment and climate.

Table 2

The perception of SG risk based on survey results

Potential SG threats	Important
Energy suppliers will benefit more than customers	32,88 %
They will generate necessity to change energy related habits	29,22 %
The cost will be high especially for low income customers	28,77 %
Collecting and sending the data of how much energy and how is being used and information about consumer electronics is a violation of customer privacy	24,20 %
Installing smart meters will increase energy bill	23,29 %
Strong communication between any network devices and home equipment increases the risk of cyber attacks	23,29 %
Energy supplier will be able to direct control energy usage of home devices and limit the energy supply	20,78 %
The sales of energy from RES can be limited (for example, allowed to sell only to energy supplier and not a neighbor)	20,55 %
Smart meter can cause different health problems	8,45 %

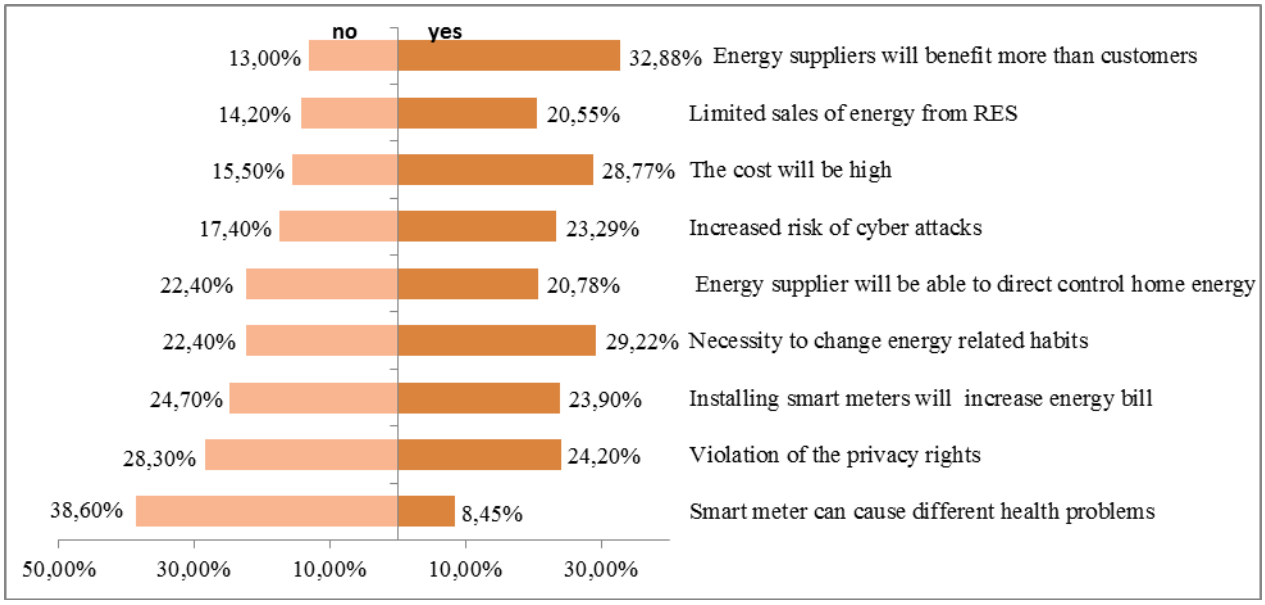

Figure 2. The assessment of potential SG risks, based on survey results

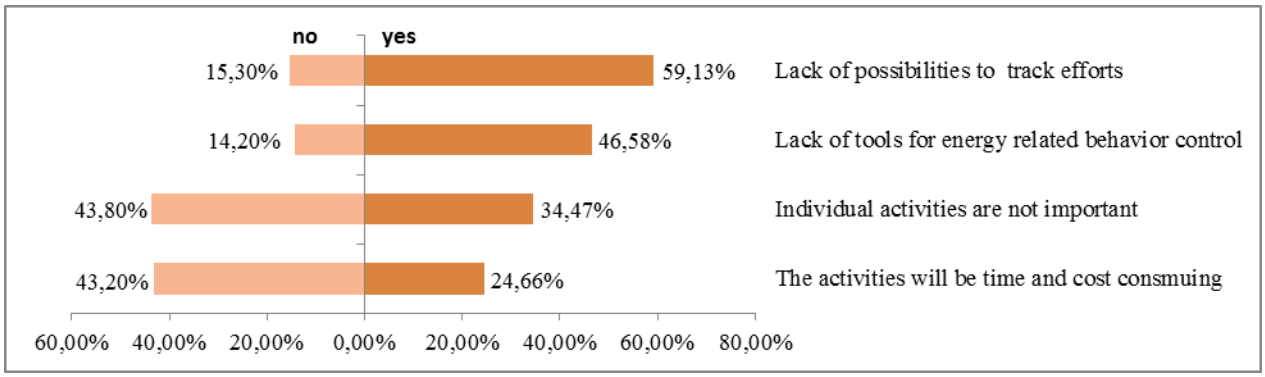

Figure 3. Discouraging factors for activities in home energy management, based on survey results

To increase energy efficiency, more than 64 % of the respondents have declared readiness to change their energy related behavior in order to reduce the energy cost, about 44 % have expressed a wish to install a RES, e.g. solar panels, in order to produce their own energy and sell it. Not only can this group of respondents play an active role in the energy market, but they can also be potential prosumers. About 40 % of respondents have expressed a wish to purchase 'green' energy, although actual participation in energy efficiency programs has been

declared by 2 % of the respondents, more than 15 % refusing participation and more than 42 % of respondents indicating the need for information campaigns to be able to make a decision. More than 38 % have declared their willingness to enter into DSM programs. The important fact is that over 20 % of them expect achieving additional benefits (such as price discounts or loyalty programs, coupons for shopping). Among the respondents ready to enter DSM programs, the largest group, about 43 %, was represented by those who live in a household with local heating system, while residents of households with electric heating were the biggest group (55,26 %), declaring the need for additional information before entering the program. Preferences for joining DSR programs were also examined in the context of house ownership, but results of the analysis have shown no significant differences for the studied groups.

A lack of possibility to track the efforts and a lack of tools to control the effects of their own energy related activities have been considered as the most discouraging factors for the activities in home energy management for the respondents. This implies that a customer who does not have the ability to control operations will not try to change the energy related behavior. The observed result may occur due to the fact that people in Lodz region in general have no possibility of detailed control of current energy cost. The results of the survey regarding respondents' assessment of discouraging factor activities in home energy management (accumulated 'yes' and 'probably yes' and accumulated 'no' and 'probably not') are illustrated in Figure 3.

In general, DSR programs can be classified as belonging to one of the two categories (York and Kushler, 2005; Albadi and El-Saadany, 2008; Zhang and Li, 2012; Pamula, 2013):

– incentive programs – using a system of incentives to reduce energy consumption, in addition to the tariffs specified in contract,
– programs based on the Time of Use (TOU) tariffs system – associated with the customer response to the proposed price of electricity during certain periods: peak, and off peak hours). This system can also be associated with the type of consumer 'punishment' for exceeding the values specified in the contract.

Preferences of different type of DSR programs have been examined in the survey. A short list of potential DSR programs and different tariff categories was presented to respondents. All the proposals of DSR programs submitted in the questionnaire were of interest among the consumers surveyed. The proposal of fixed TOU tariffs gathered greatest interest (among more than 51 % of the respondents). It is the type of an offer that some customers may have been familiar with as it appeared in the existing energy supplier's offers as day & night tariff. More than 41 % of respondents were interested in programs that offered a discount system for load reductions at certain periods. Respondents' preferences of listed DSR programs (accumulated 'yes' and 'probably yes' and accumulated 'no' and 'probably not') are illustrated in Figure 4.

The respondents were not very interested In Real Time Pricing (RTP).These tariffs are supposed to play a principal role in SG energy market. The current lack of interest may be caused by the necessity to follow a large number of market signals. The gathered customers' experience of TOU and PTR as well as the good quality of the new information systems for automatic devices control may change this attitude.

In general, survey results show that customers are interested in SG solutions and the majority of them accept the installation of smart automatically operated devices, and they are ready to take actions that require co-operation with intelligent controllers (especially when they have the opportunity to observe the effects of their actions). The presented research confirms that consumers are willing to take part in DSM programs in order to save money and are open to socially responsible behavior. But saving money and reducing energy usage are not sufficient motivators for the customers, they expect some additional value added to new DSM programs. For a massive SG solutions deployment, developing the model of involving customers in Demand Side Response program is needed.

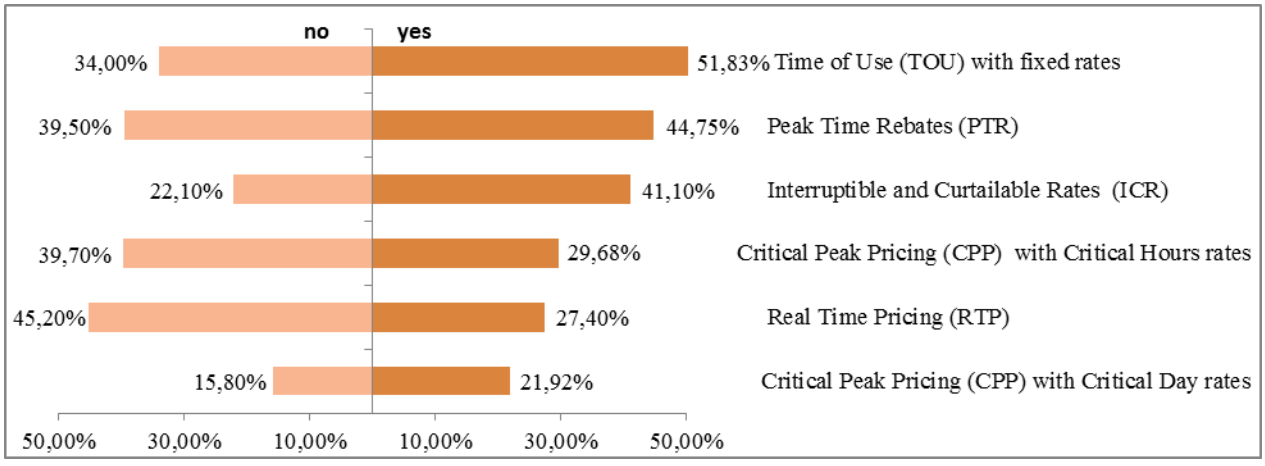

Figure 4. Preferences of listed DSR programs, based on survey results

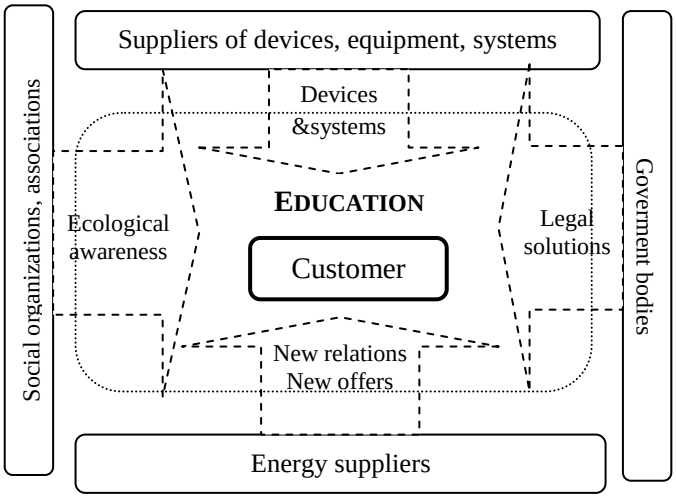

Figure 5. The elements influencing *customer involvement in new DSM programs* process

The model of residential customer engagement in DSR programs

The role of government in the development of SG solutions is not only to create a legal framework allowing customers to respond to signals coming from DSR programs, but to conduct promotional activities for the Energy Efficiency as well. The responsibility of Energy Distribution System Operators (DSO) is to take into account energy efficiency, RES and Demand Side Management programs in the process of planning the expansion of the distribution network. The DSO is responsible for organizing a technical infrastructure that allows customers to access information about current electricity consumption and for promoting behavior that increases the efficiency of energy consumption. The process of customer involvement in energy demand programs is therefore the result of actions taken by energy suppliers, government agencies, and community organizations (Pamula, 2013) which is presented in Figure 5. An important role in the process is also played by the suppliers of household appliances and heating/cooling systems, as these devices are characterized by increasingly higher energy efficiency and the ability to be automatically controlled in response to the transmitted signals of DSR program. The initiative role in creating active customer participation in DSM programs is left to the energy supplier. It is in the interest of energy suppliers (who want to reduce energy demand during peak periods) to convince the consumers and show the benefits (for both parties) of such actions. Therefore the existing model of supplier-customer relationships must be transformed taking into account active customer role in the new energy market.

The purpose of introducing changes in the companies involved in energy distribution is to modify supplier-customer relationship and the transition to customer oriented organization model. The process of studying and understanding residential customer behavior is a new idea for energy suppliers. Changing a supplier – customer relationship and increasing communication is essential for massive DSR programs deployment, because it is not enough to convince the customers to enter DSR program; motivation for continuous actions is needed.

Residential customer engagement in DSM programs seems to be a long – term process, requiring the creation of an appropriate strategy, detailed planning and integration with other plans and activities of the company. The proposed model is focused on the following issues (Pamula, 2013):

- supplier – customer/prosumer relations,
- the process of finding motivational factors determining customers/prosumers activity,
- the process of DSR offers development,
- segmentation process and targeting offers to groups of customers according to their preferences,
- education system and promotion of new demand – side response programs and energy efficiency programs.

An important role in customers engagement in DSM programs is assigned to ICT solutions, supporting the process of energy management, so those issues including new CRM system are also reflected in the model. Successful energy suppliers activities leading to strong customers engagement can be carried out by energy suppliers in the case of collaboration with social organizations (especially those in the local area that have a high level of customer confidence) and the government authorities, taking into account coordination of different Energy Efficiency programs, conducted on a national and regional levels.

Conclusions

Despite ongoing discussions and programs around the introduction of SG and the necessity to engage customers in new energy management programs as well as the large investments on projects related to the development of the new power network, consumers still do not know what effect they can achieve and how they can act to reach the benefits. Energy Distribution System Operators (DSOs)

prefer investments in the electricity grid that give them more control than DSR programs, the effectiveness of which, however, depends on the behavior of customers. Investments related to the modernization of the power grid, automation, new developments of information and communication systems are a prerequisite for changing the supplier – customer relationship, improving communication way, designing and introducing new offers of home energy management. For the Smart Grid to operate at optimum levels, it is essential that consumers adopt its new technology, DER generators and devices that allow two-way communication between a consumer and the energy service provider. To change the consumer energy related behavior, energy distributors must change their existing habits in customer relationships. It is necessary to provide the customers with new rules of operation, creating a new system of values and motivation. That is why establishing new procedures for the engagement of customers into new energy management solutions is so important. *Those utilities that understand and leverage the perceptions, behaviors, and values of their consumers will ultimately generate the most value in the new energy era* (Accenture, 2010). If customers receive basic information, that allows them to understand how they can benefit, they will more willingly join new actions, implementing the ideas of SG. Creating customer involvement in the energy demand programs is a complex process that requires the coordination of many activities (including technical issues) and changing the attitude of both suppliers and consumers. Modeling these actions must take into account the study of local customer motivation, available legal solutions, and business benefits for all participants in the energy supply chain.

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A. Pamula

Paklausos naujai energijai programų priimtinumas privatiems klientams: Centrinės Lenkijos atvejis

Santrauka

Naujos energijos rinka pakeis klientų (ne tik pramoninių ar komercinių, bet ir namų ūkių) vaidmenį. Planuojama, kad dėl išmaniųjų tinklų (angl. Smart Grid) prieinamumo, klientai bus kur kas aktyvesni priimdami su energijos vartojimu susijusius sprendimus, sąlygojamus kintančių kainų. Be to, dėl technologijų progreso klientams atsiveria naujos galimybės, t.y. gaminti ir parduoti elektros energiją. Naujovės energijos valdymo srityje reikalauja naujų paslaugų ir interaktyvios informacijos iš energijos paskirstytojų klientams. Esminis klausimas, į kurį reikia atsakyti, yra: kaip klientai galimai reaguoja į išmaniųjų tinklų technologijų siūlomas galimybes?

Tikimasi, kad klientai keis savo elgseną ir mokės už tas prekes ir paslaugas, kurias siūlo išmanieji tinklai, nes įžvelgs tame finansinę, aplinkosauginę ir kitą vertę. Straipsnyje pateikiama teorinė klientų elgsenos, naudojant energiją, pokyčių argumentacija. Privačių klientų sprendimai kaip valdyti suvartojamos energijos kiekį priklausys nuo keleto priežasčių. Nors finansinės paskatos šiuo atveju yra svarbiausios, kitų veiksnių, susijusių su vartotojo kaip bendruomenės nario vaidmenimis, poveikis taip pat svarbus. Atlikti tyrimai rodo, kad privatūs klientai mažai žino ir supranta paklausos naujai energijai programas bei priklausomai nuo geografinės padėties menkai į jas įsitraukia. Įžvelgiamas prieštaravimas tarp to, kaip vartotojas supranta ir ką jis žino apie naujus sprendimus, kuriuos siūlo energijos perskirstytojai. Siekiant vystyti naujas Paklausos valdymo programas (PVP), kurios būtų priimtinos klientams, svarbu atsakyti į du klausimus: pirma, ar vartotojai nori optimizuoti energijos vartojimą?; antra, ar jie žino, kaip efektyviai naudoti energiją ir ką daryti, siekiant optimizuoti jos sunaudojimą? Klientų įtraukimas į naujas PVP priklauso nuo jų preferencijų, požiūrių ir todėl turi remtis į vartotojus orientuotu požiūriu.

Straipsnyje pristatomi Centrinėje Lenkijoje (Lodzės regione) atliktos apklausos, kuria siekta išsiaiškinti, kiek vartotojai supranta ir žino apie išmaniųjų tinklų sprendimus, leidžiančius jiems aktyviai veikti energijos rinkoje, rezultatai. Tyrimas parodė, kad vartotojus domina išmaniųjų tinklų sprendimai ir jie neprieštarauja išmaniųjų prietaisų instaliavimui bei jaučiasi pasirengę bendradarbiauti, nes nori stebėti savo elgesio paveikumą. Be to, vartotojai nori dalyvauti PVP ir taip sutaupyti pinigų bei yra linkę į socialiai atsakingą elgesį. Kita vertus, vartotojai pažymi, kad sutaupyti pinigai ir sumažintas suvartojamos energijos kiekis visgi nėra pakankami motyvatoriai, todėl PVP turi suteikti ir kitų papildomų naudų.

Siekiant masinio naudojimosi išmaniųjų tinklų suteikiamais sprendimais, būtinas vartotojų įtraukimo į Paklausos atsako programas (PAP) modelis. Jeigu vartotojai gautų daugiau esminės informacijos, kuria remiantis jie suprastų siūlomą vertę, lengviau įsitrauktų į naujas veiklas, kurių reikia išmaniųjų tinklų idėjoms įgyvendinti. Klientų įtraukimo į PVP procesas yra kompleksinis, todėl jam reikalingas įvairias veiklas (tarp jų ir techninius klausimus) koordinuojantis mechanizmas bei siekis keisti tiek vartotojų, tiek energijos tiekėjų požiūrius. Tyrimas rodo, kad visa tai modeliuojant svarbu atsižvelgti į visų energijos aprūpinimo grandinėje veikiančių, vartotojų interesus bei teisinius sprendimus. Vartotojų įtraukimo į PVP modelis turi koordinuoti energijos tiekėjų, valstybės įstaigų ir organizacijų bendruomenės atliekamus veiksmus. Taigi esamas tiekėjų-klientų santykių modelis turi būti transformuojamas į modelį, kuris atspindėtų į klientus orientuotą požiūrį, nes energijos rinkoje jo vaidmuo keičiasi. Todėl straipsnyje pateikiamas klientų įtraukimo į PVP modelis, atspindintis energijos tiekėjų ir kliento santykį bei komunikaciją tarp jų.

Reikšminiai žodžiai: išmanieji tinklai, paklausa energijai, paklausos valdymas, paklausos atsakas, vartotojų įtraukimas.

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