

Market Research of Residential Customer Preferences

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Abstract: This paper presents outputs from the energy market poll research. The surveys aimed at describing the residential energy market structure and customer preferences. On the basis of achieved results, conditions and possibilities of introducing a DSM programme could be formulated. Those outputs could be also a good base of marketing actions connected with popularising of DSM option among utility's clients. Knowledge of the residential energy market structure and customer preferences will also be helpful in formulating the strategy for the local utility. The choice of a residential sector is not accidental, because of the number of customers and number of DSM programmes design for that group. Research connected with local energy markets and DSM seems to be very interesting from both scientific and commercial points of view.

Keywords: energy market, local utility, end-user preferences, DSM.

I. INTRODUCTION

Thanks to the initial effects of the Polish energy sector transformation, it is visible that energy is being treated by the utilities as regular consumer goods. Participants of the creation of energy markets pay more attention to effectiveness and reliability of the management process. From the economic perspective the main purpose of the utility is to increase the profitability of the electrical energy distribution and trade process. In the competitive market it is necessary to take into consideration also customer needs (reducing energy expenditures) and requirements (high service quality). Management process in such circumstances requires new attitude to the energy trade and distribution from the utilities. Achieving the balance and satisfaction of the both sides (customer and distributor) could be possible thanks to Demand Side Management (DSM).

Taking into consideration the requirements of the Polish energy law (tariffs, competition market, justified costs), utilities should aggregate reliable data for preparing their own price structure and future strategy. Utility, obligated by the domestic energy law regulation, has to include also DSM options in their load managing process. Those kinds of

actions also allow energy distributors, operating on the competitive energy market, to keep their customers closer to the company [1, 2]. From the utility perspective DSM actions should allow to control load growth (especially peak load) and alter shape of the load curve. Successful implementation of these activities depends on tailoring DSM programmes to individual customer profile and needs. Because of different customer attitudes and problem of costs and profits sharing that is connected with DSM programmes implementation, the application of load control options should be supported by careful research of energy demand structure and customer preferences [3].

The paper presents results of the opinion poll research, which have been carried out in the residential customer sector. Those surveys aimed at evaluating the possibilities of application of the following two DSM options:

- electrical energy storage on the substation level,
- heat storage on the customer level.

It was supposed that, as a result of those actions, it is possible to achieve a preferred, from the utility perspective, load profile on the substation level or (and) end-user level. Using those options based on two DSM techniques (peak clipping and valley filling) it is possible to change a load profile [4].

Data achieved from that opinion poll research should allow a formulation of conditions and possibilities of introducing a DSM programme on the local energy market. Achieved outputs could be also a good base of marketing actions connected with popularising of DSM option among customers.

II. AIM AND RANGE OF THE OPINION POLL SURVEYS

The most important part in the process of DSM programme preparation is identification and analysis of the actual and future end-user needs. According to the initial assumptions of the

experiment (DSM programmes selection) it was necessary to make researches in the following two basic fields:

- load research (energy demand characteristic on the end-user and substation level),
- opinion poll research (analysis of the customer preferences and household equipped with devices for the heat storage).

The first step of the DSM implementation process is to identify the most successful option from technical and economic point of view and potential participant's preferences. Taking into account the rank of that part, authors decided to present in that paper only results of the opinion poll research.

Market research (opinion poll) connected with DSM programmes were carried out among the customers from the residential sector. Authors decided to choose as an experiment place the urban regional branch of the local utility. The main criterion for the selection of the respondent group was the tariff of the utility's customers. Chosen group for this survey is accounting for the energy according to two period tariff-G12 (price for the energy is dependent on time of usage)¹. It was supposed that customer choosing that type of tariff is willing to control the energy demand more than others customers (with one-period price tariff). The basic information about cost and prices of electrical energy in that tariff compared with regular tariff G1 1 (price of the energy is not dependent on time of usage) are given in Table 1.

Additional criterion was the place of the potential respondent's residence. This opinion poll was designed for clients living in detached houses. It should also be stressed that in Polish circumstances the number of heat storage devices in that kind of houses is bigger than in other places of clients' residence. Those two criterions allow to obtain very interesting group of respondents - taking into consideration the chosen DSM option.

The main figures describing the group of customers chosen for opinion poll is given in Table 2.

The opinion poll was taken among customers using direct method of interview (interview with clients were conduct personally). The number of examined population (sample dimension) equalled about 5% of all customers with G12 tariff.

Table 1. Comparison of tariff charges in the residential sector (customers with 1 -phase meters)

Type of main tariff charges	Type of tariff		
	G11	G12	
	twenty four hour	peak period	valley period
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
Fixed distribution costs (per month), [USD]	0,22	0,75	
Variable distribution costs, [USD/MWh]	32,91	37,91	4,67
Electrical energy rate of charges, [USD/MWh]:	37,70	39,93	29,40
Total cost of electrical energy, [USD/MWh]	70,61	77,84	34,07

Table 2. Basic characteristic of the residential sector customers in the regional utility branch

Basic information (data collected from 01.07. to 31.07.2000)	Total number	Participation in the total number of customer /the total energy sales of regional utility branch
<i>1</i>	<i>2</i>	<i>3</i>
Number of customer in the whole residential sector	116.690	88,8%
Number of customer only with tariff G12	4.151	3,3%
<i>participation in the all residential sector</i>	<i>3,56%</i>	<i>-</i>
Electrical energy sales for the all residential sector, [MWh]	11.388	30,1%
Electrical energy sales for the customers with tariff G12, [MWh]	899	2,6%
<i>participation in energy sales for the all residential sector</i>	<i>7,89%</i>	<i>-</i>

III. HOUSEHOLDS SATURATION WITH HEAT STORAGE DEVICES

One of the most important issues of the poll was to evaluate market saturation with heat

¹ According to that tariff the price of the energy during peak period time (from 6 a.m. to 1 p.m. and from 3 p.m. to 10 p.m.) is higher than out of that period (from 10 p.m. to 6 a.m. and from 1 p.m. to 3 p.m.)

storage devices. Talking about that part of the survey it is necessary to underline one of the requirements of the previous tariff system. Customers interested in accounting for the electrical energy according to the tariff G12 had to own storage appliances in their households. Existing tariff system does not impose this kind of conditions.

Results of the research revealed that market (households) saturation factor for heat storage devices is rather low. About 61% of all respondents use such devices (including hot water supply and electric storage furnace). Only 18% of customers use electrical energy in their households electric heating systems (13,4% of them also prepare hot water using electric energy). Taking into account the main purpose of applying two-period tariffs (increasing demand for the energy in the valley period and reducing in the peak period) authors expected higher level of that factor (Fig. 1).

Thanks to poll results, it was also possible to determine a type of devices used for water heating by the respondents (Fig. 2). The majority of those appliances are hot water supplies (52,4%) allowing shifting heat storage from the peak to a valley period.

For 63% of the customers with heat storage devices, time of usage of those appliances depends only on their needs (without considering tariff system price structure). It shows that the incentives of the existing tariff system are not enough strong to influence the customer's behaviour (energy usage). Only 37% of those respondents (23% of all examined customers) switched those devices on during the low price period. Those observations were compared with results of the load research. Measurements, carried out on the end-users level confirmed results from the opinion poll. Achieved data in those two parts of the experiment shows that customers do not want to or are not able to reduce energy demand during the peak period [5].

IV. POTENTIAL CUSTOMERS PARTICIPATION IN THE DSM PROGRAMMES

In the next phase of this research, customer knowledge about methods of effective energy usage was examined. According to the questi-

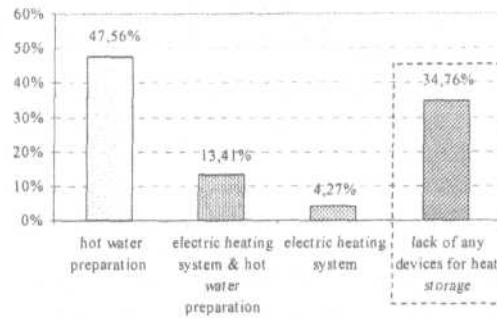


Fig. 1. Households saturation with heat storage devices.

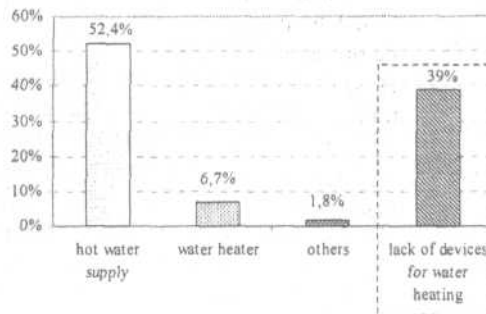


Fig. 2. Devices for water heating in the households.

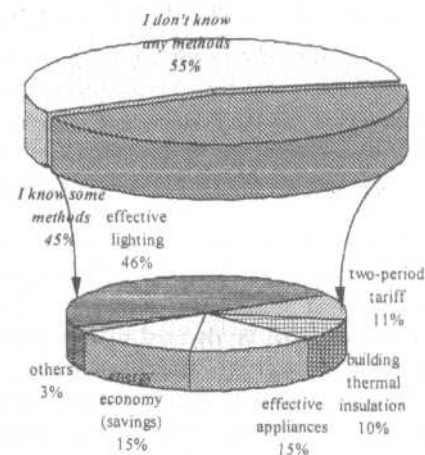


Fig. 3. Options increasing effectiveness of electrical energy usage - chosen by customers.

onnaire, only about 45% of the respondents know methods of effective energy usage. More than 81% of those customers confirmed that they use methods improving the effectiveness of an electrical energy usage. Fig. 3 shows the achieved results.

On the top of the clients' list is effective lighting (46%), the second place is taken by replacement existing devices with more

effective (15%). For the 11% of customers, the only one known method of effective energy usage, is two-period tariff. Data presented in Fig. 3, concerns the customers knowing the methods mentioned above.

The second important point of that research was attempt to evaluate the customer eagerness to participate in costs of DSM programmes and a degree of interest in those programmes. Among 78% of customers interested in participation in DSM programmes, about 76% (65% of all examined customers) gave their assent to cover a part of programme costs. In order to evaluate the potential amount of a customer subsidy, a hypothetical situation was presented.

It was supposed that during the first year of DSM programme operation, it is possible to save about 75 USD on electrical energy expenditures. About 34% clients were willing to spend on the programme less than 25 USD. Customers from that group pay more than 15 USD per month for the electrical energy usage. Almost 26% of respondents would spend on that project from 25 to 75 USD. It is necessary to underline, that majority of that customers also pay more than 25 USD per month for the electrical energy usage. In addition, more then 40% of those customers use electrical heat systems in their houses. Only 5% of respondents were able to spend more than 75 USD for that purpose.

Eagerness to participate in costs of DSM programmes was compared with the monthly income of those clients. The income of clients spending on that programme less than 25 USD is lower than 75 USD (per person in a household). Opinion poll results show that the amount of subsidy depends on the customer's financial status (earnings).

The last point of that poll was the evaluation the DSM option, which would be accepted by examined respondents (potential participants of the DSM programme). The results of received client's answers are given in Fig. 4. That graph shows the rank of the most popular activities chosen by customer (three from seven options) among options submitted in the questionnaire.

The most popular and most interesting (profitable) activity for the respondents is installation of the effective lighting (62%). The second option chosen by respondents is also connected with change of the household devices (option chosen by 48%). The last position on

that ranking is taken by mutli-period tariff. Only 28% of clients classified that option on the third place. Achieving data in those two last positions of the rank show the bigger customer's indecisiveness comparing with the top of the list. Those results also confirmed that customers are interested in well-known activities with visible and comprehensible effects.

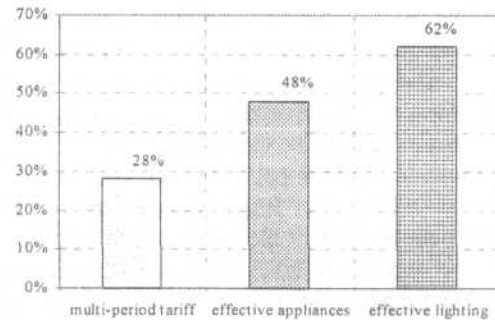


Fig. 4. DSM programmes rank – option chosen by customers.

Activities related with central controlling of heat storage devices by the local utility were not chosen at all. Authors are of the opinion that applying this kind of DSM option is possible in co-operation with end-users. Lack of customer's interest is the second significant reason to reject the proposal of the DSM options connected with peak load modelling on the end-user level by controlling the heat storage devices. Achieved results show that the second option connected with battery energy storage (BES) on the distributor level in those circumstances could be more effective and well grounded.

It was supposed that using battery energy storage it is possible to control and change power demand profile (profitable, from the utility perspective). Furthermore, use of BES should increase distribution ability of the local utility (power delivery with minimum and justified costs). It is expected that, thanks to the programme mentioned above, economical benefits according to the binding tariff system will be achieved by the user (utility) [5]. Usefulness and legitimacy of the options usage should be evaluated by utility planners using cost-benefit tests. Acceptance of that option will be made on the basis of the cost-benefit test effects.

V. CONCLUSIONS

Results described in the paper indicate that information base including DSM programmes, generally speaking - options for increasing effectiveness of energy usage, is not sufficiently popularised. Client's lack of knowledge (know-how) in that field strongly influences the success of DSM programmes implementation. This situation indicates the necessity of applying by distributor marketing actions (promotion) together with popularising DSM option among their customers. Those results show also usefulness of those kinds of surveys for the distributors (energy services companies).

Presented opinion poll results are only the part of the DSM study, Important element of the whole experiment is measurements programme on the substation level. Taking into account achieved results of market research (lack of interest in controlling heat storage devices on the end-user level), battery energy storage on the distributor level could be more interesting from technical and economic point of view. In order to evaluate costs and benefits of that option it is necessary to examine load profiles on the substation level. Achieved data will be the basis for sizing of BES device. Final results of the market and load research will be used to estimate benefits of considered DSM option from utility and customer perspective.

VI. ACKNOWLEDGEMENT

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