Market leading marketing concepts in the management of consumer behaviour on the energy market

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Abstract Power industry transformations are accelerating due to the developments and advancements of the new technologies. The potential of electric power industry companies is being strengthened which contributes to the supply and demand development on the electric power services market. In connection with this, leading marketing approaches to management are changing on the electricity markets. In the nearest future, the role of marketing in the electricity sector is supposed to increase significantly. Energy marketing is seen as an activity aimed at meeting consumer demand for energy services. The demand management becomes particularly important which fully fits one of the marketing definitions.
The objective of this paper is to analyse the development of complex strategy for the power industry using leadership marketing concepts. The paper considers the architecture of electricity markets. We propose the structure of marketing activities on the energy market, taking into account the macroenvironment features.

1 Introduction

In the conditions of overall transformations in the field of electric power industry, an energy market consumer should become an "active consumer" being capable of optimizing its energy consumption. Consumer revitalization in the energy sector through the involving into the value creation process based on the marketing system and Demand Chain Management mechanisms has transformed into the industry system of consumer "revitalization" mechanisms – Demand Side Management, which aims to increase energy efficiency (overall reduction in consumption) and create competition on retail electricity markets by changing the behaviour of active consumers.

The application of marketing principles and approaches allows to influence the consumer-agents behaviour, turn it from "passive" to "active", change consumer functions and its role in the energy system providing it with new opportunities: demand management, expansion of additional system services for load regulation, which makes consumer capable of competing with generation.

Consumer behaviour during the process of energy supply source choosing significantly depends on the application of the new technologies of generating and network objects management, marketing principles and approaches, which allows managing the demand correctly.

Electricity is a product whose properties are initially set; therefore, consumer behaviour in choosing the source of this product will primarily be determined by the price, which is determined by many factors. These factors include climatic, geographical, as well as technical.

The use of marketing in the power industry is supposed to be an activity aimed at studying and meeting consumer demand for energy supply services, influencing this demand in order to make enterprise activity more successful and improve its market position. The main activities of energy marketing include forecasting and

studying demand, analysing and maintaining competitiveness and developing pricing policy. An “active consumer” in such a context becomes a partner of the energy market and forms itself the requirements for quality and consumer properties of goods, which leads to some changes in market participants behaviour, namely to the concept of interaction with consumers.

The article is structured in the following way: the second section provides a brief overview of scientific literature on the topic, the third section provides a brief analysis of the energy market, and the fourth section contains some recommendations for modelling the behaviour of the energy market “active consumer” using leadership marketing concepts.

2 Literature review

Global trends in power engineering, power engineering economics, methods and models of predictive studies of the interrelationships between power engineering and power engineering economics are presented in analytical studies and reports (see e.g. Market design and regulation during the transition to low-carbon power systems 2016). The analysis of power industry market and its development potential in Europe is presented in IEA (2017). The Agency for Forecasting Balances in the Electric Power Industry has predicted the development of electric power industry for the period up to 2030; in the analytical report by SEDC (2017) market development and regulation trends are revealed.

Foreign and Russian authors describe the advantages and necessities of alternative energy sources development on the energy market: Trachuk and Linder (2010), Haas and Loew (2012), Brown et al. (2012), You et al. (2017), Akasiadis et al. (2017), Lisin et al. (2018), or Newbery et al. (2018).

Competitive positions of the electric power market are disclosed quite fully in works of Trachuk and Linder (2017), or Firsova et al. (2018). In addition, Snikkars (2017) gives a justification for methods of market regulation and requirements for product quality and competitiveness in his study "Energy: Trends and Prospects".

Electricity market modelling is described in works of Marchenko (2005) taking into consideration generating capacity development. Components and features of rational demand on energy markets are revealed in works Starke and Nasr (2013) "Demand Response Availability", Hurley et al. (2013), Sidorovskaya (2015), Khokhlov et al. (2018).

The issue of ensuring the process of "active consumer" behaviour on the market as well as revealing main factors influencing such behaviour aimed at creating tools, which will let consumers form the strategy of their behaviour on the market has not been currently studied, especially in Russia. Customer focus is an important marketing factor in active consumer behaviour shaping.

Consumer activity in the energy sector through its joining the process of creating value is based on the system of Demand Chain Management methods and mechanisms that appeared in the 1990s and developed in a number of works: Yuttner et al. (2008), Moeller and Raial (2008). Additionally, Okorov et al. (2012) or Frankel and Wagner (2017) in their research draw attention to necessary involving electricity consumers in the value chain and forming a new industry structure based on realization of its new functional feature customer focus. An important aspect while forming Demand Side Management mechanisms is consumer behaviour background research (Khokhlov et al. 2018)

Makarova et al. (2014), Eid et al. (2014), Abrham et al. (2015), or Balcerzak et al. (2016) show that consumer behaviour is determined not only by the electricity price, but also by the degree of satisfaction with the consumption schedule. Leading researchers base their approaches to assessing consumer satisfaction on works of the founders of the theory of consumer choice.

The tasks of choosing strategies for active consumer behaviour are rooted in consumer behaviour management inside the electric power system. These tasks consist mainly of consumer behaviour management aimed at smoothing the load schedule of the electric power system, which does not sufficiently reflect the consumer interests, since it does not take into account the possibilities of using its own generation and is not oriented to the electric power market. At the same time, the theory and methodology of consumer behaviour management require substantial improvement while the electric power industry becomes smarter because the new technological basis significantly changes the possibilities for consumer involvement in the industry value chain. In this regard, the process of shaping a system of conditions necessary for realization of “active” consumer economic behaviour in the electric power system is a scientific problem of current interest that is essential for the country's electric power industry development.

3 Description of data and methodology

At present, consumer management resources are proactively vying with proposals of new generating capacity. For example, EDF uses the CAP-2030 strategy; proximity to the consumer has become the main focus in demand management: providing assistance in energy consumption management through “smart” technologies; increase in

renewable energy capacities. In 2016, the "Open Power" strategy was launched, aimed at the development of smart grid technologies and new ways of managing energy efficiency using digitalization.

The transition to "new energy industry" is possible. It has been already called Energiewende, Energy Transition, the "energy transition", in which the capacity included in demand management programs will increase from 39 GW (2016) to 144 GW (2025) (Fig. 1).

According to Rosstat, in 2016, total capacity of operating power plants in Russia was 25 MW. According to McKinsey & Company, in 2017 the UPS of Russia was about 5 GW of distributed generation with a capacity of less than 25 MW. The total capacity of distributed generation facilities in Russia as of 2017 can be estimated at approximately 23-24 GW.

Data analysis of the current state of distributed generation showed a rough estimate of the share of distributed generation, as well as the dynamics of its change.

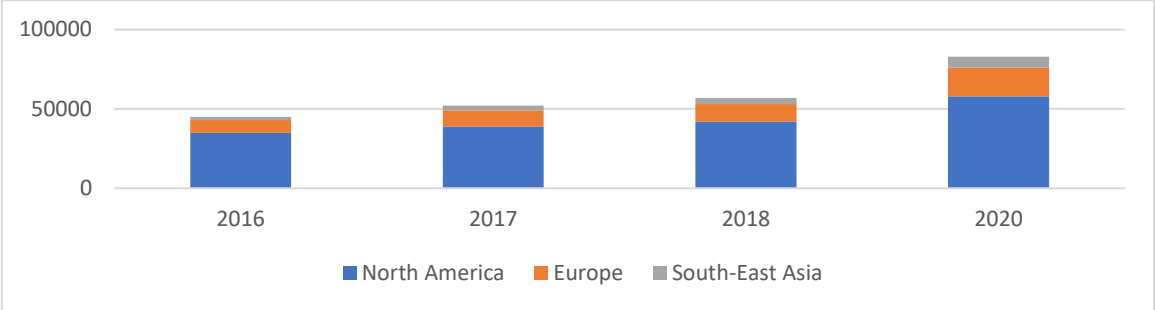

Fig. 1. Forecast of the new energy development, contributing to an increase in the capacity included in consumer management programs
Source: IEA (2016)

The analysis also allowed us to identify four types of distributed generation, which are priority for the Russian conditions, as shown in Table 1.

Table 1. Types of distributed generation, which are priority for the Russian conditions

Types of distributed generation	Capacity	Participants
Large heat power plant near an industrial consumer	Capacity 25 – 600 MW. Technology – steam power (for plants commissioned in the 20th century) and gas turbine or gas piston (21st century). Most often – cogeneration.	Metallurgy (Norilsk Nickel, MMK, Evraz, RUSAL, NLMK, Severstal, Metalloinvest) Neftegaz (Rosneft, Gazprom, Gazprom-Neft, Surgutneftegaz, Lukoil, Sakhalin Energy, Yamal LNG ...) T Plus, the company Lukoil)
Energy centre for a small consumer (medium, small business)	Capacity – usually from 500 kW to 10 MW. The technology is most often gas-piston, less common - microturbine. Most often - cogeneration.	Business owners (Magnet, Tape, Mosavtosteklo ...) Distributed energy operators (leasing schemes, BOT, BOO, etc. – for example, Stark, E.ON CE)
Energy centre in an urban-type settlement (small town, township, village, micro-district)	Capacity – usually from 500 kW to 30 – 50 MW. The technology is most often gas-piston, less common – gas-turbine. Most often – cogeneration.	Developers in the residential real estate market (TEN, SU-155, Sibir, Sphera) GenCos with a large share of CHP (T Plus, SGK, GEH, etc.) Heat supply organizations (eg heating networks in Bogdanovich, Almetyevsk)
Microgeneration on renewable energy sources	Capacity – up to 15 – 20 kW. PV, wind generators, less common – storage batteries.	Individuals – homeowners

Source: IEA (2017)

The first three types describe electric power plants that are close to consumers and produce thermal and electrical energy (primarily for the needs of these consumers) in a single cycle.

According to the analysis of competitive capacity take-off (CCT) for 2021 conducted by the System Operator, applications for a 54 MW power reduction were taken into account in the second price zone of the

wholesale market (all applications were submitted by RUSAL aluminium plants in Bratsk, Sayanogorsk and Novokuznetsk). This value should be about 0.1% of the total generation capacity of the second price zone selected at CCT.

The assessment of change in electricity demand in this study was made by the ERI RAS on the basis of a long-term forecast of the socio-economic development of the Russian economy for the period up to 2035. The main case is based on the premise of a gradual slowdown in global economic growth from 3.2% in 2016 to 2.8% by 2020, and the subsequent location of global economic growth rates in a narrow range of 2.5-2.9 percent. This is due to the expected slowdown in economic dynamics in both developed and developing countries. The conservative case is also based on a significant slowdown in global economic growth, which will primarily be connected with the economy of China.

The forecast values show that by 2025 the growth rate will be 1.8%, and by 2035 it will increase to 2.6%. Both options of Russia's socio-economic development are based on the average scenario of demographic forecast made by Rosstat which states that Russia's population will remain at around 147 million until 2035 (IEA 2017)

The analysis of changes in capacity at other electric power plants (nuclear power plants, hydropower plants and plants on renewable energy sources) showed that the growth of nuclear generation in the UPS is possible at 7.3 GW (by 26% compared to 2016, CAGR of 1.2%). The development of nuclear power plants will mainly be concentrated in areas of existing hydroelectric power plants. The growth of hydrogeneration in the UPS over the same period is foreseen at a level of 4.3 GW (9%, CAGR 0.5%) mainly in Siberia and in the Far East. Growth in the capacity of large electric power plants on renewable energy is likely to be 2.8 GW mainly in the European part of the country (South, Volga, North-West) – according to the General Scheme-2035. The cumulative increase in capacity of nuclear power plants, hydropower plants and plants on renewable energy sources is estimated at 14.4 GW (19%, CAGR 0.9%) (IEA 2017).

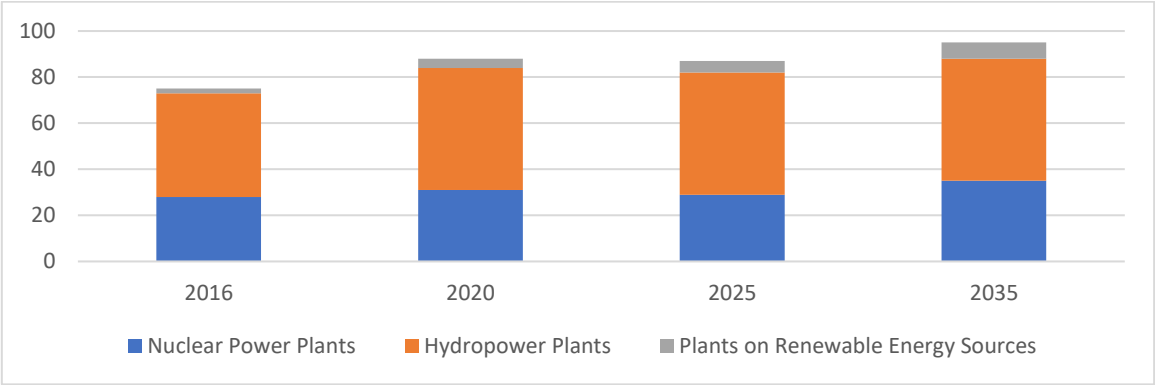

Fig. 2. Forecast increase in capacity, GW
Source: IEA (2017)

4 Modelling the behaviour of the "active consumer" of the energy market using leadership marketing concepts

Energy marketing at the industry level is evolving. It can be defined as an activity aimed at studying and meeting consumer demand. Let us highlight the main activities of energy marketing (Table 1).

Nowadays demand management becomes particularly important, which fully fits one of marketing definitions. Therefore, the main areas of marketing activity in electric power companies are demand forecasting (load consumption), pricing policy development (tariff menu), demand management (consumer incentives), competitiveness maintaining. Considering the complex model of the energy market, the following market entities can be distinguished.

Wholesale market entities are wholesale and local generating companies and energy sales organizations, major electricity consumers. The Federal Grid Company is also a market participant. Technological infrastructure entities are federal grid companies, interregional grid companies, and regional power grids. Organizational infrastructure entities are trading system administrators, system operators, regional dispatch offices. Retail market entities rely upon consumers and suppliers.

Thus, there are four main groups of entities. Sellers, customers, submarkets and infrastructure organizations providing management and coordination are allocated on the wholesale market. Retail market entities include power grid companies, energy sales companies, guaranteeing suppliers, electrical energy producers that do not comply with the rules of the wholesale market, electrical energy consumers (including population).

Table 1: Main activities of energy marketing

Company name	Activities
Generating companies	Maintaining the competitiveness of good (service), pricing policy, demand management, market segmentation, building a rational sales structure of generated energy.
Power grid companies	Forecasting the demand for services (determining future load and reliability requirements), VE – analysing the electric grid complex, planning "tariff menus", demand management in the service area, researching resource markets to ensure companies technical and organizational development.
Energy sales companies	The exploration of wholesale and retail markets, competitiveness analysis, management of business losses in networks, search and development of a business diversification strategy.
Energy traders	Brand marketing shaping, pricing policy development, customer loyalty building, the organization of interaction with transmission and distribution networks, the organization of electricity purchases, demand exploration.

Source: IEA (2017)

The observation of foreign energy markets helps to note that the presence of a financial submarket as a part of their architecture reflects the degree of energy market development as a whole. Figure 3 shows an example of German power market.

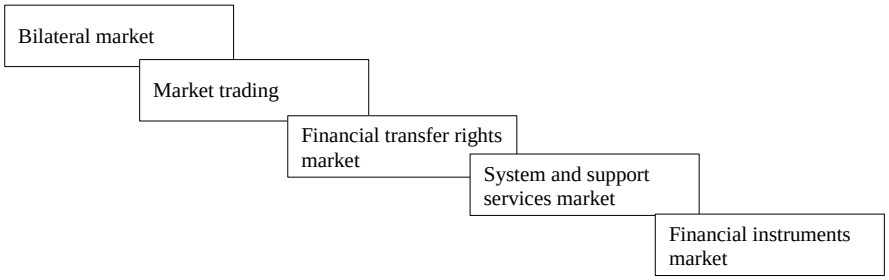

Fig. 3. German power market architecture
Source: Snikkars (2017)

Russian specificity is characterized by lack of developed market for financial instruments. Organizations that are responsible for Russian market functioning and development (non-commercial partnership "Sovet Rynka", The Ministry of Energy of the Russian Federation) are already actively working on the creation of market for financial contracts (MFC). A futures contract is supposed to become the most popular financial instrument at the initial stage of MFC development in Russia.

The wholesale market model is the basis for creation of the target competitive model, whose development will follow the path of creating "subsidiary" submarkets serving power systems in the future. Currently, there are six distribution channels:

1) wholesale manufacturer → wholesale consumer;
2) wholesale manufacturer → organized market → wholesale consumer;
3) wholesale manufacturer → intermediary supplier → retail consumer;
4) wholesale manufacturer → organized market → intermediary supplier → retail consumer;
5) retail manufacturer → guaranteeing supplier → retail consumer;
6) retail producer → retail consumer.

In the near future, controlled interfaces, energy routers necessary for intelligent control of energy exchange between systems; management platforms that provide unified access to all distributed energy resources will become the new elements of Russian market architecture.

The main principles of modern architecture should be, firstly, the bidirectional exchange of energy in distribution network, secondly, the use of controlled interfaces and means of power flow controlling; thirdly, a decentralized multi-agent approach to managing power systems of various sizes, ensuring uninterrupted power supply to consumers, taking into account dynamically changing technical and economic conditions of energy exchange.

The new architecture starts to build up "down up", from the side of small distributed generation and final consumers of existing power systems, and at the first stage begins to "capture" energy facilities of relatively low power (10–10000 kW) operating at low and medium voltage (0.4–10 kW). At subsequent stages, the implementation of new energy technologies and the energy Internet will affect all the levels of Russian UPS and will completely change market architecture.

5 Conclusions and implications

Overall, our paper revealed a number of problems, among which the main one is the unreadiness of state regulators and infrastructure organizations of power engineering to the emergence of new types of "active consumers" on the market.

Unfortunately, technological unpreparedness of Russian electric power system to mass appearance of "active consumers" connected to network leads to the obsolescence of technical regulation and design standards in the field of power engineering because of their orientation towards outdated technologies. The extensive practice of cross-subsidization actually continues to grow despite the fact that the government declares its liquidation.

As aforementioned, it is necessary to take a number of actions to improve the situation, namely: to develop and adopt laws to introduce a new type of power market participant – an "active consumer". It is also necessary to improve the rules for trading systems for the creation of distributed energy markets that ensure efficient exchange of goods and services between traditional market participants and participants of a new type.

Furthermore, we should also reconsider the practice of cross-subsidization in power engineering with a purpose of technological renewal and increase in energy efficiency in the areas of electric power industry where this can bring the greatest result.

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