

EXPANDING THE USE OF DIFFERENTIAL TARIFFS AND SERVICE FEES AS A FACTOR IN THE DEVELOPMENT OF ENERGY SECTOR

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Introduction. Selecting the model of the national energy market is a rather complicated and step-by-step process, although there are a number of models of reforms in the world market, which have had a positive impact on the development of the economy and energy. Nevertheless, the need to develop and effectively implement ways to improve the regulation of Armenia's energy sector has become imperative over time.

The regulation of the energy sector of the Republic of Armenia is one of the key issues of the economy of the Republic of Armenia, which aims to balance the interests of consumers and entities with activity licenses upon the establishment and control of the activity rules, regulatory tariffs and licence conditions in the electricity, heat energy and natural gas markets, to create equal activity conditions for the persons with activity license and to promote formation and development of competitive market. Thus, the efficiency evaluation of the operation of electricity generation, supply and distribution system and the study of justification of current tariffs and the application of the differentiated tariffs and service fees are of utmost significance.

There are significant challenges in the energy system in terms of ensuring adequate energy supply, and pursuing affordable and sustainable tariff policies for consumers.

Methodology. The following research methods served as the basis for scientific research: empirical research methods: observation, comparison, measurement, methods used both at the empirical and theoretical stage of research`abstract, analysis, econometric, statistical, factorial, system analysis, as well as grouping methods, tabular and economic-mathematical methods.

Literature review. The theoretical and methodological basis for solving the study tasks are the main provisions of classical and modern theories of economics, the works of domestic and foreign researchers, legislative regulation of the sphere and by-laws.

Scientific novelty. As a result of the study, will be presented recommendations for improving the tariff methodology of electricity power: the observation is differentiated by the possibility of tariffs and the separation of service fees. The main goal for the energy system and organizations generating solar electricity is to justify the introduction of a fee. One of the important results of this study is also the determination of the service fee and its comprehensive justification. Of course, there is a need to establish differentiated tariffs for electricity and its assessment of the complex impact both within the entire framework of the energy system and within the framework of economic entities and resident subscribers.

Analysis. The regulation of the activity of the constituent objects for the power system in Armenia is carried out through laws, by-laws and decisions. Particularly:

- The Law of the RA on Energy was adopted on March 7, 2001.
- The Law of the RA on Public Service was adopted on March 23, 2018.
- RA PSRC 18.08.2018. The concept of the new structure of the RA electricity wholesale market approved by the decision N 289L - the concept of electricity trade, the concept of ensuring the energy security of the RA.
- RA Public Services Regulatory Commission N 125-N 16.09.2005 decision on approving the methodology for calculating electricity tariffs (capacity) supplied by electricity generating companies
- Public Services Regulatory Commission of RA N 541-N 13.12.2017. Decision on approving the methodology for calculating tariffs for electricity and distribution services sold to consumers by "ELECTRIC NETWORK OF ARMENIA" CJSC
- Methodology for calculating the required income and Tariff Margin of the Licensee, Annex N1 Conditions of the license N0092 for distribution of electricity (capacity).

The quality of energy sector regulation, as well as the efficiency of public administration activities, directly affect the running costs of existing companies and the organization of production processes. An efficiently regulated system promotes efficiency increase and innovations, while inert administrative processes or late regulatory technical decisions can jeopardize productivity growth and competition¹. The main guarantee of effective activity in the market is to ensure a level playing field of competition among all market participants, which is the main task of the regulator. When operating in such conditions, the companies themselves are interested in improving their own efficiency,

¹ “European competitiveness report 2004”; Ch. 2, Sec. 2.2,1 “ Justification for public intervention in R&D and instruments”, Commission staff working document SEC (2004); ISBN 92-894-8227-3

which leads to an increase in production volumes, and consequently to the reduction in prices. One of the goals of our research is to identify the real development level of Armenian market via analysis of the legislation regulating the energy market of the RA and revealing the current shortcomings and to present the directions of its perspective improvement, which we believe will lead to effective development of the RA energy sector.

Let's present the main provisions of the tariff policy in the RA electricity system. The basis for the development of the methodology for calculating electricity tariffs is the decision N 125-N of 16.09.2005 of the Public Services Regulatory Commission of the RA on approving the method of calculating the tariffs for electricity (capacity) supplied by electricity generating companies. Based on the latter, the principles of calculating the producer's tariffs and the provision of electricity transmission service by an entity with a license for electricity transmission activity are defined. The principles include: providing the necessary revenue, cost analysis and tariff setting. The key to tariff calculation is the principle of providing the necessary revenue, assuming a certain amount of revenue, which will allow the Licensee to have all the operating costs necessary for reliable, safe, continuous operation, as well as an acceptable (reasonable) return on invested capital. The components for calculating the required revenue are the eligible annual expenses, depreciation of fixed assets and allowable profit. Eligible costs include current expenses incurred during the year of calculation of tariffs, which will contribute to the uninterrupted and regular activity of the organization, including operating, maintenance, and fuel costs. Depreciation in this case is calculated by the linear method. The two main directions of defining the allowable profit are as follows:

- 1) method of net assets profit rate; that is the product of profit calculation base (PB) and allowable profit rate (PR),
- 2) Method of reimbursement of necessary financial costs.

Thus, the basis for calculating the tariff margin is the principle of ensuring the necessary revenue of the licensee; according to the latter the required revenue of the account year (for 12-month period) is calculated via the price of purchased electricity, operational and maintenance costs for the licensed activity, depreciation of fixed assets involved in the implementation of licensed activities and depreciation of intangible assets, the amount of allowable profit for the net assets involved in carrying out the licensed activity, the amount of allowable profit for the net assets involved in carrying out the licensed activity, the difference between the cost of electricity purchased and the required revenue of the licensee, the amount to be reimbursed as a result of the deviation from the calculated and actual values, the difference of the amount of unsecured receivables and proceeds from the provision of electricity distribution service to legal entities by a licensee. According to the decision/decreed of RA Public Services Regulatory Commission N 541-N 13.12.2017 on approving the methodology of calculating the

tariffs for the sold electricity and distribution service rendered by the “Electric Network of Armenia” CJSC for cost analysis and their distribution among consumer groups, all costs of the distributor are classified into three groups:

- 1) electricity (capacity) purchase costs (including Compensation amount),
- 2) electricity distribution costs,
- 3) consumer service costs.

Electricity distribution costs are fixed costs, which include the costs of operating and maintaining the distribution network (repair, material, labor costs, etc.), depreciation costs of fixed assets, and amortization of intangible assets, except for the customer service costs referred to in paragraph 8 of the mentioned methodology. The eligible return on the fixed assets raised from investments and on the net value of intangible assets is considered as an expense and included in the electricity distribution costs. Consumer service costs include those for recording data on electricity metering systems, billing, collection of money from customers for electricity sold, bad debts, and other customer service costs. The formation of consumer groups is carried out based on the principles of having the same consumption characteristics of each consumer group, creating an equal price load for the electricity system. Electricity consumers are classified into:

- 1) 110 kW power consumers,
- 2) 35 kW power consumers,
- 3) 6(10) kW power consumers,
- 4) 0.38 and 0.22 kW power consumers.

The distribution of costs among consumer groups is carried out through the following stages:

- 1) distribution of electricity (capacity) purchase costs,
- 2) distribution of electricity distribution costs,
- 3) distribution of consumer service costs.

The costs of purchasing electricity (capacity) are distributed among the consumer groups according to the following formula: Consumer service costs are distributed among consumer groups (also Distribution Network Technologies) as follows:

- 1) the costs of collecting money from customers for the sale of electricity are entirely attributed to the consumer group of 0.38 and 0.22 kW,
- 2) other consumer service costs are distributed according to the proportion of the number of customers in the consumer groups.

The calculation of electricity sales tariffs for consumer groups is the following. Tariffs for electricity sales for consumer groups are set in a single rate tariff system. The service to be paid in the single-rate tariff system is electricity consumption, the unit of measurement of which is AMD / kWh. In the case of differentiated tariffs (day and night) at different hours of the day, the electricity sales tariffs (SE) calculated for the

consumer groups are average weighted quantities. Tariffs for the distribution service are set in the single rate tariff system; they are differentiated according to the consumer groups determined according to the above-mentioned methodology, taking into account the requirements of the Trade Rules. These are electricity tariffs in 1997-2022:

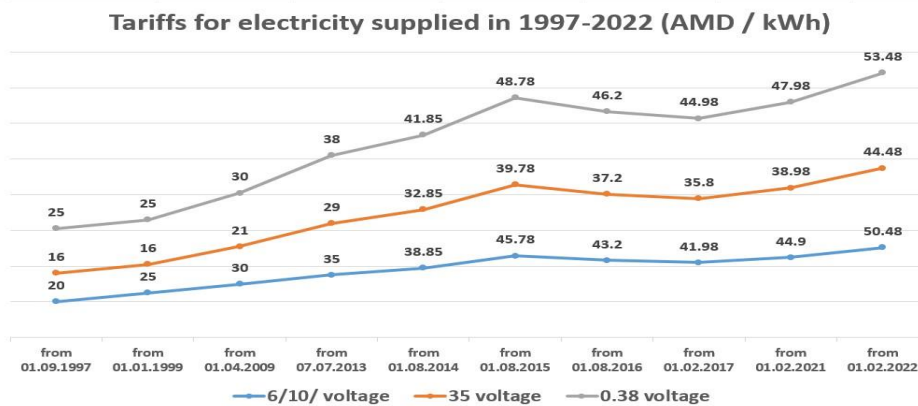


Figure 1. Tariffs for electricity supplied in 1997-2022.

During 1997-2022, the electricity tariff for Armenian consumers has been changed 10 times. The longest period, when the electricity tariff remained the same, was 1999-2009. It is noteworthy that in those years, in conditions of stability in electricity tariffs, the Armenian economy recorded mainly double-digit growth. Electricity tariffs in Armenia have increased dynamically since 1997, with the exception of 2016, when the new government was formed by K. Karapetyan, negotiating with the Tashir Group, reduced the electricity tariff. However, in following years, due to objective and subjective factors, the tariff increased again. The increase in electricity tariffs for businesses in 2021-2022 is of particular concern, which, of course, had an impact on the level of inflation and business competitiveness. In 2021, ENA supplied 6.2 billion kWh of electricity, out of which 33% was consumed by the population, 24% - by industry, 3% - by budget organizations, 3% - by the irrigation system, 2% - by the transport system, and 1% - by the water supply and drainage systems, while 34% - other consumers. It should be emphasized that the largest identified group of consumers after the population is industry. Therefore, the idea of having differentiated tariffs is primarily relevant in case of industrial organizations. Setting differentiated electricity tariffs, particularly in the case of industrial organizations in the processing sector can significantly increase the competitiveness of this sector not only in domestic but also in foreign markets. Let's present the productive supply of 20 high-cost electricity customers by 2021. It amounted to 1 billion 388 million kWh. In order to study the distribution of productive supply for 20 customers, we have separated the administrative-territorial units of the Republic of Armenia. Particularly, 3 out of the above stated 20 customers operate in Syunik marz, however, the volume of productive supply is 614.2 million kWh, which is 44.25% of the overall pro-

ductive supply of 20 customers. In Yerevan, 7 organizations out of the mentioned 20 customers are operating but the volume of productive supply makes 206.3 mln kWh, which is 14.86 % of the 20 customers' productive supply.

ELECTRICITY SUPPLIED BY ARMENIAN ELECTRIC NETWORKS COMPANY IN LARGE GROUPS

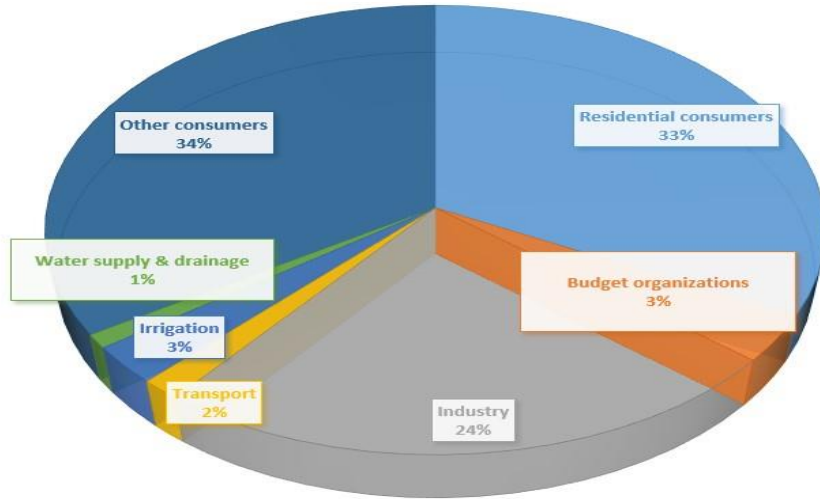


Figure 2. Electricity supplied by ENA per enlarged groups

The other 9 organizations operate in the regions/marzes of Ararat, Lori and Kotayk, whose productive supply volume makes 191.8 mln kWh, 190.9 mln kWh and 171.2 mln kWh, respectively. In the Armavir region only 1 organization out of 20 customers takes activities, whose productive supply volume makes 13.7 mln kWh.

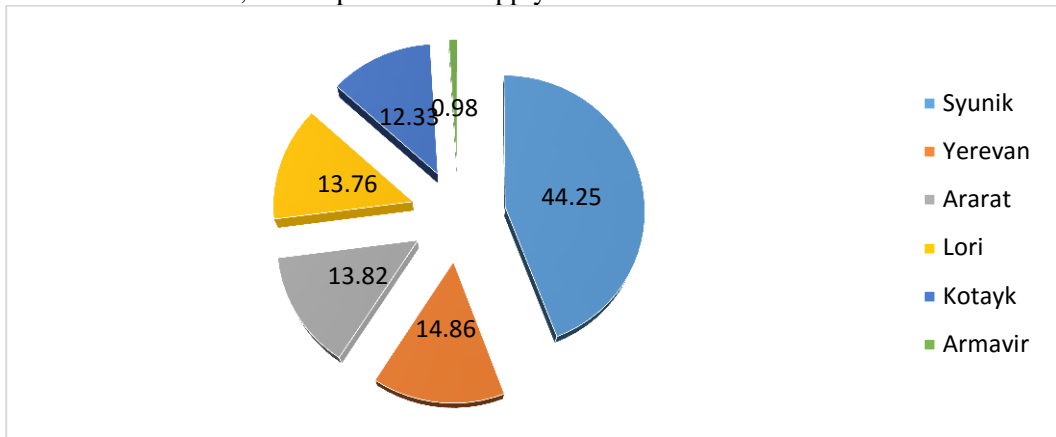


Figure 3. Percentage distribution of productive supply in 20 high-cost electricity customers throughout 2021.

In the result of studying the distribution of productive supply of 20 high-cost electricity customers during 2021 per the activity areas, it has been disclosed, that mining companies consume 91.6%, while those engaged in production activities and service providers – 4% and 4.4%, respectively.



Figure 4. Percentage distribution of productive supply in 20 high-cost electricity customers throughout 2021 per the activity areas.

Armenia has favorable conditions for the development and use of non-traditional energy sources. In the joint context of ensuring stability of the RA economy, improving the social welfare of the country's population and raising its living standards, the change in the direction of the national energy policy has become urgent. According to the US Energy Information Administration/Agency, the volume of electricity used in 2006-2030 will increase by 44%. Analysts predict that by 2050, global energy demand will increase 1.2 times. In addition, by then the world population is projected to grow by 1.7 billion, which will also lead to high energy demand. As a result, it is predicted that prices in energy resources will also rise. According to the RA strategy and strategic plans, the RA energy industry has 4 pillars:

1. safe and reliable power supply,
2. development of production capacities,
3. maximum use of internal renewable resources,
4. regional integration or energy system diversification.

During the recent 20 years, the tariffs for electricity supplied to only population have almost doubled in our country, which should remind Armenia, being not rich in fuel and energy resources, to develop the energy sector, infrastructures, generated capacities and the market, reducing dependence on imported energy resources. These resources are called renewable or alternative resources. Solar energy is considered to be one of the cleanest energy sources. Solar energy has become quite attractive and profitable in Armenia. According to forecasts, in 2028 solar energy will become so cheap and widespread that it will be able to meet all human energy needs. According to the measurements, in Armenia on the average about 1700 kWh electric energy on 1 square meter

area can be annually generated, which is twice as much as the European average indices, where this number is close to 1000 kWh. Since 2015, it has been established, that the electricity generated in the automatic solar stations and supplied to the grids is not taxed. It has been also stated that in order to meet their needs the citizens can install up to 150 kWh, while economic entities – up to 500 kWh automatic solar stations which will enable to generate and consume electricity in sunshine hours, whereas to send the unused electricity to the grids, meanwhile in sunless or slightly sunny weather the sent electricity can be retrieved from the grids. The fact that neither individuals nor economic entities pay maintenance fees while using the existing infrastructure, is left out of that process and their number is gradually growing.

In total, there are 10.5 million jobs/working positions related to the renewable energy industry according to the calculations for 2020, while the solar photovoltaic plants are the largest employers. Renewable energy systems are rapidly becoming more efficient and cheaper. The data show that the cheapest tariff sold to ENA is 10.844 drams¹ and their share in the total energy consumption is increasing. As of 2019, more than 2/3 of the newly installed electricity plant capacity worldwide was renewable. As of 2020, in most countries, photovoltaic solar energy and land wind are the cheapest way to build new power plants. The cheapest tariff sold to ENA is 10.844 drams.

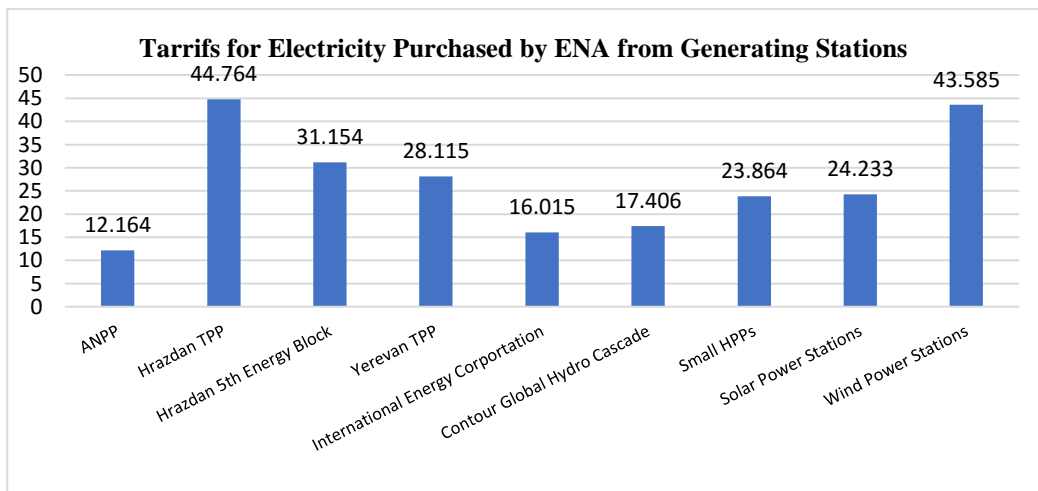


Figure 5. Tariffs of Electricity purchased by ENA from generating stations in 2020.

As of January 1, 2021, 4144 automatic generating solar stations with a capacity of 76,844 kW were connected to ENA, and 234 ones with a total capacity of 8536.01 kW were in process. Throughout 2020, the amount of electricity supplied by the autonomous power generators to the distribution network was 35,225,201 kWh.

¹ <https://www.arlis.am/DocumentView.aspx?DocID=131066>

Physical and legal entities can install autonomous solar stations with a capacity of up to 150 kW and 500 kW for their own needs. As of April 1, 2021, 4599 autonomous energy generators with a capacity of about 89959.11 kW were connected to ENA and 366 ones with a total capacity of about 9978.395 MW are in process.

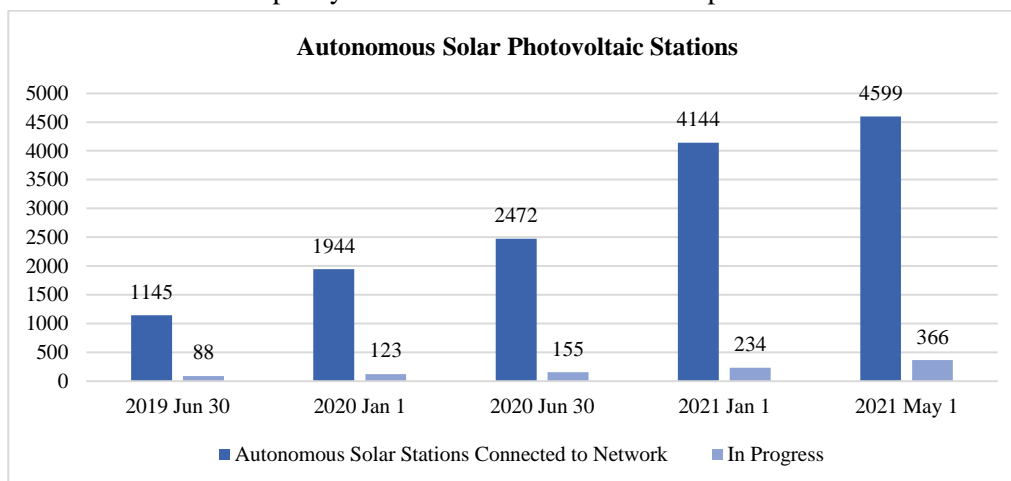


Figure 6. Quantitative changes of autonomous solar photovoltaic stations throughout 2020-2021

Considering the quantitative changes of autonomous solar photovoltaic stations during 2020-2021, we can conclude that the largest increase in their installation was registered in the period from June 30, 2020 to January 1, 2021 (see Figure 6). It is worthy to look at the differentiated electricity tariffs in some countries. In Russia electricity tariffs vary widely, depending on the group of consumers (urban population, rural population, commercial consumers, etc.), specific area and time zone. The separation of the tariff for urban population is also related to heating method: when using gas stove the tariff is different from the one when electric heating devices are used. Electricity tariffs for commercial consumers are not regulated. It is formed by the price received as a result of bargaining in the wholesale electricity market, the cost of electricity transmission through electricity networks, the cost of electricity supply services, and the sum of other surcharges. It is noteworthy that in the case of legal entities, the electricity tariff depends on the volume of its consumption, the method of electricity metering (single, night/day, daylight peak/daylight half-peak/night), the ability of the consumer to predict the amount of electricity consumption and other factors. Electricity tariff distinction per the time zones is implemented in the following way:

1. Tariff according to two time zones:

- a. daylight (peak) zone, which covers the period between. 07:00-23:00.
- b. night-time zone, which covers the period between 23:00-07:00,

2. Tariff per three time zones:

- a. overloaded (peak) zone, which includes the periods of 08:00-11:00 p.m. and 20:00-22:00.
- b. half-load (semi-peak) zone, which includes the periods between 07:00-08:00 p.m., 11:00-20:00 and 22:00-23:00,
- c. night time zone, which includes the period of 23:00-07:00.

For example, in the city of Moscow, starting from July 1, 2021, according to the two time zones, in case of tariff application, the night-time tariff for the urban population is almost 64% cheaper than the day-time tariff, and according to the three time zones, the tariff for the half-load (semi-peak) zone is about 17 % cheaper than the tariff of the overloaded (peak) zone and is almost 60% more expensive than the tariff of the night-time zone. In Belarus, for both the population and commercial consumers, a differentiated electricity tariff is applied according to two time zones and three time zones. For instance, in case of differentiated three times zones (06:00-15:00, 15:00-23:00, 23:00-06:00) for the commercial consumers (in case of connection with 750 kWh capacity) the tariff for the period within 06:00-15:00 is the most expensive, moreover, the difference between the tariffs operating in the mentioned periods can reach about 48%.

Electricity tariffs in Kyrgyz Republic are differentiated according to the volume of consumption (up to 700 KWh and more), according to the location of consumers' residence (mountain zone, etc.), consumer's groups (industrial, agricultural, etc.), industrial branches depending on the energy capacity, e.g., the tariff for 1 kWh for mining or gold mining enterprises is multiplied by 2 factors, and for enterprises for the cement production, the tariff for 1 kWh is multiplied by 1.3 factor. In Ukraine, the tariff for electricity is differentiated for both two and three time zones, while in Georgia and Moldova the tariff is differentiated depending on the group of consumers, consumption volumes, etc.

Conclusion. Thus, it can be inferred that the largest distinguished consumer group after population is the industrial sector. Therefore, the idea of having differentiated tariffs is primarily relevant to consider in case of industrial organizations. Differentiated electricity tariff setting particularly for the industrial organizations in processing sector could considerably boost the competitiveness of the mentioned branch not only in the domestic but also in foreign markets. It is worthwhile mentioning, that the solar energy sector is full of rather promising perspectives for the RA economy and for the energy sector on the whole.

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Expanding the Use of Differential Tariffs and Service Fees as a Factor in the Development of Energy Sector

Keywords: electricity market, state regulation, differentiated tariff, service fee, tariff margin, generating stations

The article analyzes the current state of the RA electricity market and presents the legislative regulation of the sector, as well as the main provisions of the tariff policy in the RA electricity system. In particular, the methodology of calculating electricity tariffs (capacity) supplied by electricity generating companies, the methods of calculating electricity tariffs for electricity sold to the consumers by "Electric Networks of Armenia" CJSC, distribution service fee, the necessary income of a licensee and the method of calculating the tariff margin has been viewed. The dynamics of electricity tariffs for 1997-2022 is analyzed, the factors influencing the latter are identified, the electricity supplied by "ENA" CJSC is presented in enlarged groups, and the percentage distribution of productive supply of 20 high-cost consumers of electricity by 2021 per activity areas have been introduced. Tariffs for the sale of electricity supplied from electricity generating stations by using renewable energy resources in the territory of the Republic of Armenia have been analyzed, the impact of differentiated tariffs, relevancy and impact of setting differential tariffs and service fees on the electricity market participants has been considered. The world practice of applying differentiated electricity tariffs has been studied.