Unified informational statistical base as a tool for monitoring energy efficiency of industrial facilities

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Abstract. Sustainable development of the global and national economies requires special attention to optimizing the structure of the energy balance by creating effective energy saving tools and improving energy efficiency of those types of economic activities that are the largest end-users of energy resources - industry, population and transport. The article defines the problems of energy policy in the industrial sector of the economy. Of key importance in the study are the prerequisites for the formation of a methodology for assessing the energy efficiency class of industrial facilities. The article provides information on the dynamics of energy intensity from 2010 to 2018 and information on the planned indicators of reducing the energy intensity of the national economy. The comprehensive plan of measures to improve the energy efficiency of the economy of the Russian Federation, approved by the Government, contains a link to the rating system of industrial enterprises planned for development, which confirms the relevance of the research topic. An analysis is made of public information about industrial enterprises, on the basis of which problem areas are identified for the formation of a unified information statistical database, proposed as a basis for monitoring energy efficiency indicators of Russian industry and identifying priority issues for the implementation of specialized state programs.

1. Introduction
Considerable attention is paid to the issues of optimizing energy costs at all levels of the legislative and executive authorities of the Russian Federation, which is reflected in various forms of economic and energy foresights. As noted in the Energy Strategy project 2035: the development of energy conservation and energy efficiency in energy consuming sectors is one of the key scenario conditions in predicting the prospects for the development of the fuel and energy complex. Over the past 10 years, the energy intensity of the GDP of the Russian Federation has decreased by only 9%; over the past 4 years, the energy intensity of the GDP has not decreased. The purpose of the study is the formation of a unified statistical base as part of the approach to energy efficiency management of industrial facilities. Research object are industrial facilities. Under the industrial facilities understand the property complex used by the subject of industrial activity for its implementation (enterprise, workshop, site, unit and other production units). From the point of view of construction, it is customary to identify an industrial park with an industrial facility - a complex of production, warehouse and office premises, located, as a rule, outside the city limits on a
large land plot, united by a single solution in the construction of engineering networks and transport infrastructure.

As part of the study, it is necessary to ensure the classification of industrial facilities, taking into account their industry affiliation and purpose, which is traditionally taken into account when developing their architectural and structural solutions. At industrial enterprises, within each industry, a clear gradation of buildings is distinguished by the types of main and auxiliary industrial buildings, namely:

- main production buildings (concentration, steelmaking, rolling, textile, and other workshops);
- auxiliary production buildings (repair and instrumental workshops, assembly shops, etc.);
- energy facilities (compressor, thermal power plants, air conditioning);
- objects for production and transport purposes (electric depot, garages);
- Warehousing facilities (warehouses of raw materials, finished products, fuels and lubricants, modern logistics centers);
- buildings for administrative and domestic purposes, laboratory production and experimental design purposes.

The preliminary gradation of industrial facilities is proposed to be adjusted taking into account the indicated classification system for industrial buildings, in view of the fact that unification of the collected information on the studied facilities is required.

The subject of the study is the systematization of a statistical database of sources and indicators relevant for assessing the energy efficiency of industrial facilities.

Research task: analysis of dynamics of GDP energy intensity and the degree of achievement of target indicators of the state programs; systematizing the statistical database on the sources and indicators relevant to the assessment of energy efficiency of industrial facilities – develop a database of industrial facilities in accordance with the registry of the Russian classification of economic activities (OKVED-2) and the State information system industry (GISP); analysis of statistical databases for the purposes of classification of industrial facilities according to the level of energy efficiency.

2. Materials and Methods
The study uses public statistics presented on the portals of the Federal Statistical Office (Rosstat) and published in the collections “Annual Statistical Collection 2019” and “Russia in Figures 2019” (Section 16 Industrial Production) [1, 2].

The database is based on information from the following public authorities:
- Ministry of Industry and Trade - Register of Domestic Product Manufacturers (GISP-PP719) [3];
- The Ministry of Energy and the Ministry of Economic Development of Russia - data from the annual Reports on the state of energy conservation and energy efficiency in the Russian Federation [4].

To identify enterprises, an additional analysis of basic OKVED codes was carried out based on personal cards of enterprises.

The key analysis method is the factor method, which assumes that when parameters are combined into factors, each factor accumulates general laws in all parameters, discarding the characteristics of each parameter separately.

3. Results
Based on an analysis of data from the Ministry of Industry and Trade of the Russian Federation, a database of the GISP registry has been compiled. Enterprises were systematized by 39 industries and identified in the OKVED 2 system by basic codes.

Figure 1 shows the most numerous groups of enterprises classified by GISP.
The study showed that 511 enterprises did not provide data in the GIS, and therefore can only be determined by the OKVED. The largest group of 105 enterprises belongs to the light industry. To identify the most energy-intensive types of activities, the Rosstat data was analyzed. More than 80% of total fuel and energy consumption is accounted for in the four most energy-intensive sectors of the Russian economy: electricity and heat (28%), manufacturing (22%), population (17%), and transport (16%) (Figure 2). This consumption pattern has remained constant since at least 2015.

At the end of 2018, the energy intensity of the Russian Federation's GDP decreased by 12% compared to 2007, which indicates a significant lag in the actual rate of its decline from the target value. Thus, in accordance with presidential decree No. 889 of June 4, 2008 "on certain measures to improve the energy and environmental efficiency of the Russian economy", the Government of the Russian Federation has set a goal to reduce the energy intensity of GDP by 2020 by at least 40% relative to the level of 2007. If the average rate of decline in the energy intensity of GDP for 2007-2018 remains equal to 1.1% per year, it will be possible to reach the target of 40% only by 2043 (figure 3).
Figure 3. Planned achievement of the target value of the energy intensity of the GDP of the Russian Federation at the current rate.

Almost all of the progress in reducing the energy intensity of GDP was made in the period 2000-2008, when there was a noticeable shift in the structure of GDP in favor of less energy-intensive economic activities (figure 4).

Figure 4. The dynamics of energy intensity of GDP to the level of 2000.  

Figure 5. The dynamics of energy intensity of GDP to the level of 2008.

GDP growth of 60% was accompanied by almost constant primary energy consumption. Immediately after 2008, there was an increase in the energy intensity of GDP until 2011, which was replaced by a decrease in 2013-2015, then the energy intensity of GDP remained unchanged (figure 5).

This period was characterized by a slowdown in economic growth and was accompanied by an increase in the share of energy-intensive activities in the structure of the economy, positive changes in favor of less energy-intensive industries stopped. The GDP growth rate was comparable to the growth rate of primary energy consumption. The end of the period was also marked by almost zero dynamics in the energy intensity of GDP.

On April 19, 2018, the government of the Russian Federation Approved a comprehensive plan of measures to improve the energy efficiency of the economy of the Russian Federation. The comprehensive plan provides for the implementation of measures to improve the energy efficiency of the Russian economy, including in relation to industrial enterprises. The plan is aimed at ensuring the modernization of fixed assets, increasing the contribution of the technological factor to reducing the energy intensity of the gross domestic product to at least 1.5 percent per year, and reducing the technological gap between the Russian Federation and the leading countries. Among other things, the plan provides for the creation of a rating system for industrial enterprises in Russia that implement measures in the field of energy conservation and energy efficiency, and the introduction of a mechanism to encourage industrial enterprises to implement energy conservation and energy efficiency measures. It is planned to develop methodological recommendations for evaluating the
effectiveness of energy saving and energy efficiency measures in industry in order to encourage industrial enterprises to implement energy saving and energy efficiency measures.

4. Discussion
During the formation of the IISB on the energy efficiency of industrial enterprises, limitations and problematic aspects of statistics collection were identified, which include:
- Lack of mandatory registration requirements at GISP - at the moment, the procedure for filling out information submission forms is advisory. This leads to the fact that to date, about 42% of the enterprises accounted for by the Ministry of Industry and Trade, as enterprises producing Russian products that comply with the OKVED-2 codes of industrial activity, have not provided data for accounting in the GISP. Such a number of enterprises should not be removed from statistics, because inaccuracy of accumulated data will be too high. The conclusion presents the simplest option to eliminate the existing problem;
- To determine the potential for energy saving, it is necessary to identify the current costs of industrial enterprises for energy resources and determine the normative indicators for specific types of activities. In the GISP system and on the portal of the Ministry of Economic Development, which is responsible for monitoring energy efficiency issues in all sectors, there is no information on energy consumption, and obtaining information through third-party organizations that ensure the certification of industrial facilities is impossible due to the confidentiality of this document. This is one of the most difficult problems and, at the same time, the most important task of research. The collection of data on energy passports of enterprises can provide a high degree of accuracy in the development of regulatory indicators. This is due to the fact that this document is formed on the basis of not only a documentary analysis of information on energy consumption for the past 3 years, but also based on the results of an instrumental survey, which allows us to state the actual data on energy consumption and energy loss - which is the basis of the formed energy saving potential.

5. Conclusion
It is proposed to provide aggregation of data on enlarged industry groups of industry defined in the GISP system, with the possibility of appropriate interpretation of information based on OKVED-2 codes included in enterprise cards.
At this stage of the study, it is assumed that it is necessary to provide a meaningful description of the energy intensity indicator of the economy as a whole and the industrial facility in particular, taking into account foreign experience of assessment and giving the possibility of objective international comparison. At the moment, the system for monitoring the energy intensity of the economy and industries needs to be adjusted.
In the continuation of the study, it is assumed the determination of industrial facilities - the determination of the identity of technical and economic indicators of technological processes of the categories “energy-intensive” and “non-energy-intensive”.
For non-energy-intensive activities, it is necessary to create a system for mass implementation of standard technical projects for the implementation of energy-efficient programmatic measures [8]. An important tool for implementing measures aimed at reducing the energy intensity of such enterprises will be the use of solutions from the Collection of the best available technologies (NTD), which requires regular updating [9].

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