



Российское
Энергетическое
Агентство

Energy efficiency benchmarking of industrial enterprises in the Russian Federation: a joint project between the Russian Energy Agency and UNIDO

Mr. Tikhon Koveshnikov

Head of Department for State Program Oversight and Science and Education

Definition and objective of the industrial energy efficiency benchmarking system



Benchmarking is a process of interpretation, understanding and adaptation of existing examples of efficient performance of a company in order to improve its own performance.

Energy efficiency benchmarking is a process of gathering and conducting analysis of information for the assessment and comparison of efficiency in the use of energy resources.

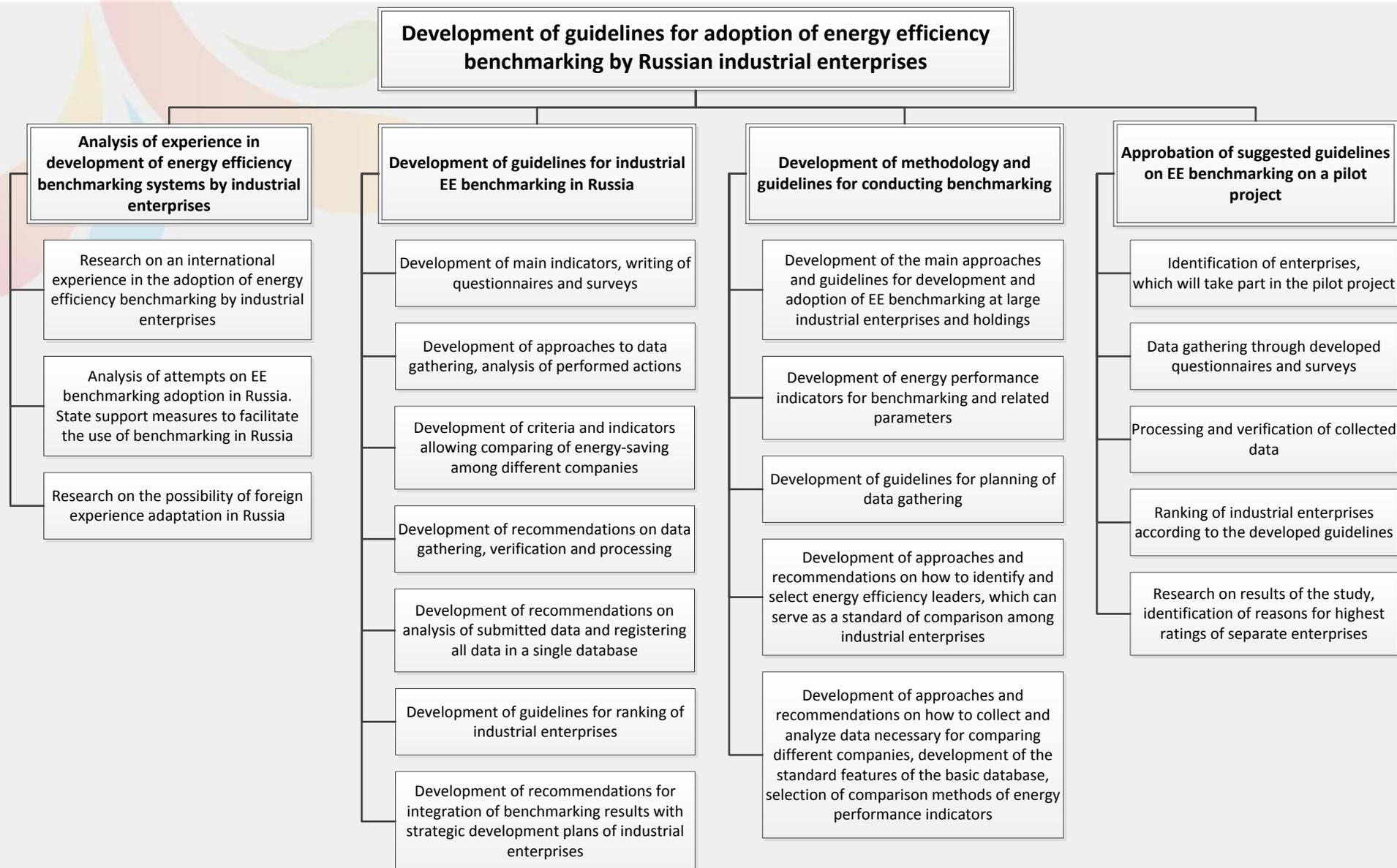
External energy efficiency benchmarking is the process of gathering and conducting analysis of information for the assessment and comparison of efficiency in the use of fuel and energy resources by several facilities (enterprises).

Main objectives and tasks of the developed system:

The main objective is to improve energy efficiency of Russian industrial enterprises

The results of implementation of this system include the awareness raising of companies about energy efficiency of production, ability to determine their ratings among companies in the same industry, development of a database on the best available technologies, used in the same sector of economy, development of recommendations for improving energy efficiency of companies, which took part in this study, development of information environment for the use by the state authorities in order to improve a legislative framework and industry-specific standards, ability to calculate the potential for economy of energy resources.

Methodology and system development stages



The system is owned and operated by the Russian Energy Agency

Based on the international experience on the development of energy efficiency benchmarking systems, the Agency can provide the following services:

1. Ensure access to the confidential database as official representatives of the Ministry of Energy of the Russian Federation for the subsequent development of a ranking system without disclosing specific indicators of respondents
2. Ensure verification and accuracy of data
3. Enable automation
4. Enable integration of benchmarking results into the state and industry-specific development strategies

Calculation of baseline indicators characterizing energy efficiency of Russian industrial enterprises. Data sources used for research

Baseline indicators of industrial energy efficiency benchmarking include those indicators, which are converted into the internationally accepted units of measurement:

- Energy intensity of the main products (works, services) tons of oil equivalent per unit of products

- The volume of consumed energy resources used for production of main products (works, services) per one employee (based on the average staff): tons of oil equivalent

Gathering of such data in Russia is conducted under the terms of mandatory requirements to regular energy audits of industrial enterprises and is accumulated in the SIS “Fuel and Energy Complex” operated by the Russian Energy Agency.

Thus, we suggested taking data from the certain industries collected during energy audits of industrial enterprises for the baseline comparison indicators, and adapt them for the purposes of the our research.

Content and sequence of actions for ranking of industrial enterprises in one sector of economy:

- 
1. To develop a list of enterprises operating in the identified industry.
 2. To develop a draft database of indicators, characterizing energy intensity of production of the main types of products (works, services) using data from energy passports of enterprises, submitted to the SIS “Energy and Fuel Complex”, and additional data submitted by enterprises on a voluntary basis.
 3. To form a group of experts, specialists working in this industry, representatives of academic community and supervisory federal executive authorities.
 4. To develop and submit to experts a questionnaire for identification of experts assessments of the main factors, that have an impact on energy consumption during production of the selected types of products (goods, works, services), and of weighting coefficients for these main factors.
 5. To develop lists of factors, which have the strongest impact on energy consumption out of all types of main factors reported.
 6. To collect original data from enterprises, which take part in the research.
 7. To conduct a general ranking of enterprises according to their energy efficiency without subdivision on separate groups. The highest rating is assigned to an enterprise, which has the lowest value of energy intensity of production of the main types of products (EI). Other enterprises are ranked in increasing order of EI.
 8. To conduct a ranking of enterprises within each group of enterprises, having the same or similar values of main factors for consumption and the strongest impact on energy efficiency.
 9. To conduct a ranking of enterprises within each subgroup of a group of enterprises, having the same or similar values of the main factors, which have a significant impact on their energy consumption.
 10. To conduct a total ranking taking into account weighting coefficients of each factor, then the final ratings are assigned (total rating of all enterprises, and separate ratings of groups of enterprises having similar production volumes of the main types of products).
 11. To develop recommendations.

Collection, verification, and processing of data, which characterize energy efficiency of enterprises which submitted such information



- A certified energy auditor, which is a member of a self-regulatory organization, conducts energy audit, collects data, develops and fills in questionnaires, fills in energy passport, energy declarations;

- Forwarding energy passport to the self-regulatory organization, checking and verification of data by the self-regulatory organization;

- Return for adjustments or sending an energy passport, approved by a self-regulatory organization, to the Ministry of Energy of the Russian Federation, verification of data contained in the energy passport by the Ministry of Energy of the Russian Federation;

- Registering energy passport, approved by the Ministry of Energy of the Russian Federation, with the SIS "Fuel and Energy Complex", checking and verification of data contained in the energy passport by the system within homogeneous groups of enterprises.

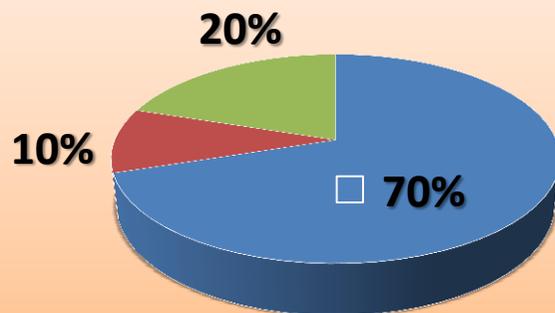
Collection of data, characterizing energy efficiency of enterprises, which submitted such information, **is carried out stage by stage through a multi-level verification system:**

Quantitative content of expert groups during research

Total number
of experts, who
took part in
research:

274

- Oil and gas industry – **81** experts
- Cement industry – **62** experts
- Bakery industry – **82** experts
- Pulp and paper industry – **49** experts



- Representatives of industrial enterprises
- Representatives of executive authorities in charge of the project
- Representatives of scientific community

Sample of questionnaire



Full name of organization/ name of expert _____

Type of activity _____

Which non-productive factors have the strongest impact on energy consumption during production of the main types of products?

Factor 1 _____

Factor 2 _____

Factor n _____

Which parameters and criteria can be used to evaluate these factors and their impact on energy consumption during production of the main types of products?

Factor 1 _____

Factor 2 _____

Factor n _____

Whether an economic approach to energy consumption among employees at an enterprise is being incentivized?

Whether special technologies and mechanisms (energy management, economical production, etc.), related to energy efficiency enhancement are being used at an enterprise?

Signature of employee/scientific expert responsible for energy-related issues at an enterprise

Date « ___ » _____ 201__

Stamp _____

Questionnaire of a certified expert

Information about expert		
No.	General information	Detailed description
1	Name	
2	Date of birth	
3	Citizenship	
4	Type of activity	
5	Place of work	
6	Place of main work	
7	Education (can be several inputs)	
8	Degree (if applicable)	
9	Academic status (if applicable)	
10	Total work experience	
11	Current scientific and expert profession	
12	Professional work experience	
13	Participation in the work of expert councils	
14	Expertise, including scientific and technical experience, for the recent 5 years	
15	Contact details	
Grading parameters under the homogeneous groups (industry-specific influence)		
	...	

Data of the homogenous groups on the example of OIL PRODUCING companies

Water cut

An average value of 74% in Russia should be equal to 1.

Value of water cut	Weighting factor
10%<	1,67
10%-20%	1,56
20-30%	1,43
30-40%	1,35
40-50%	1,25
50-60%	1,18
60-74%	1,11
74%	1,00
74-85%	0,91
85-95%	0,81
95-100%	0,76

Burial depth

An average value of 4212 meters in Russia should be equal to 1.

Value of burial depth	Weighting factor
500<	2,00
500-1000	1,43
1000-1500	1,32
1500-2000	1,23
2000-2500	1,19
2500-3000	1,11
3000-3500	1,08
3500-4212	1,05
4212	1,00
4212-5000	0,83
5000-5500	0,79
5500-6000	0,75
>6000	0,67

Well capacity

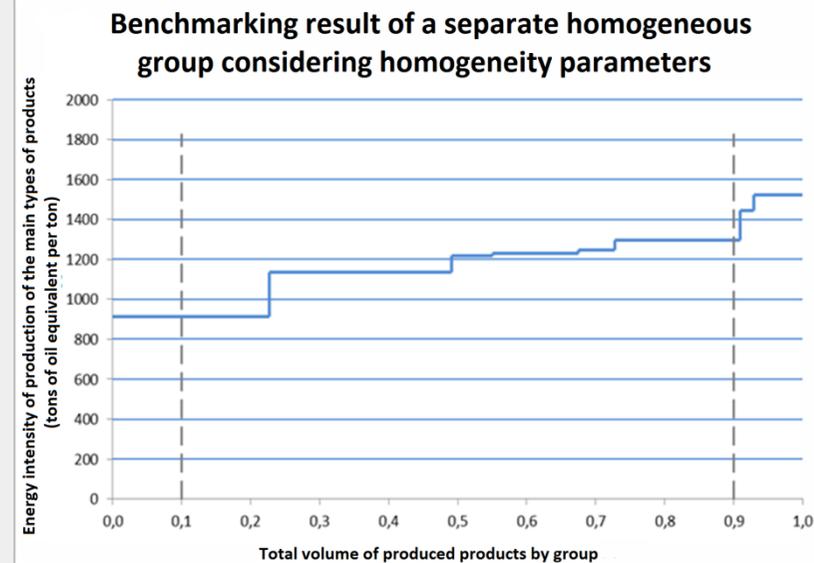
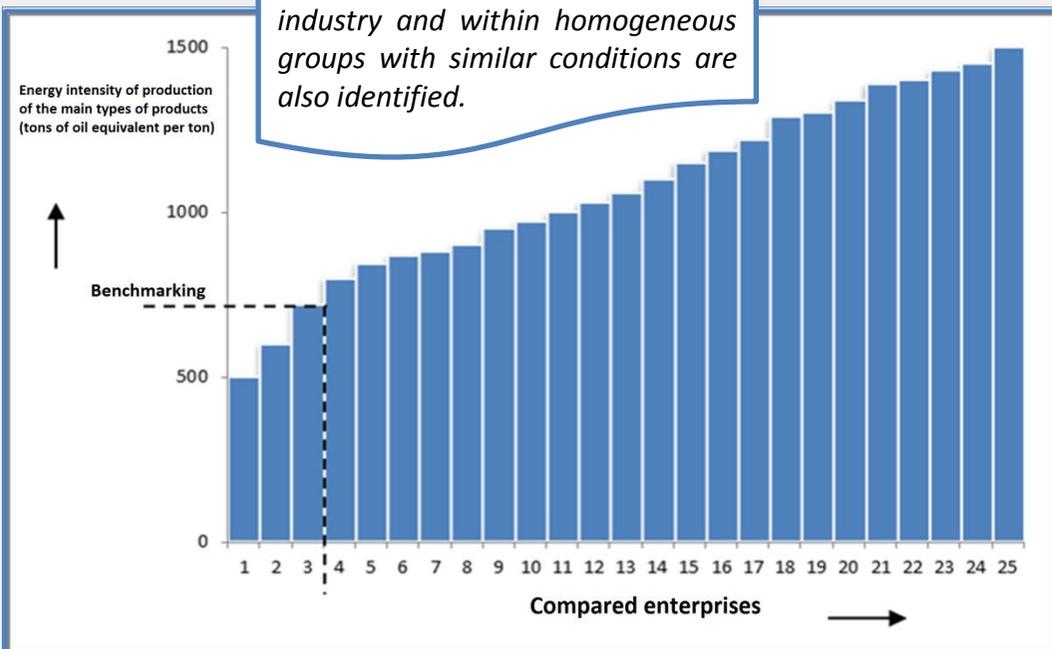
An average value of 11,4 tons per day in Russia should be equal to 1.

Value of daily capacity	Weighting factor
5<	0,63
5-8	0,69
8-11,4	0,77
11,4	1,00
11,4-15	1,03
15-20	1,16
20-30	1,22
30-40	1,33
40-50	1,41
50-60	1,49
60-80	1,56
80-100	1,64
>100	1,75

Development of recommendations for integration of benchmarking results into strategic plans on development of industrial enterprises

Based on the benchmarking results of enterprises of a particular industry, several groups of ratings are being developed depending on the type of a sample of original parameters and requirements to the homogeneity of sample groups. A rating for the whole industry, as well as a place of each enterprise in this rating is being constructed. Separate ratings for enterprises with similar set of parameters are also constructed.

The place of each enterprise in the rating is determined, as well as leaders and outsiders for the whole industry and within homogeneous groups with similar conditions are also identified.



Analysis of energy-saving and energy efficiency enhancement measures taken by the leaders of the rating, and achieved economy enables to form a package of recommendations for participants of the rating with calculation of approximate energy economy.

Automated information panel (follow <http://bench.setra95.ru/>)



The results of the work are represented on an automated information panel, which enables visualization of verified data of studied enterprises in the form of interactive dynamic models, showing ranking results based on selected benchmarks.

- A general design layout of the Portal was developed and introduced:

Industry Bench

Welcome, Тихон Ковешников

Home

Regions

Oil Companies

Cement Companies

Bread companies

Paper companies

Methodology

Vocabulary

Contact

Welcome to energy efficiency benchmarking system!

Our system is aimed at making public ratings of industrial enterprises based on their energy efficiency. The benchmarking is performed using modifiers, which may have different weight depending on industry and expert evaluation. In current version of automated benchmarking system the ratings are calculated for a pilot group of 50 oil extracting companies which are divided in 3 homogeneous groups based on depth, debit and watering of their oil wells. In order to see the rating for each homogeneous group, please, click on the interactive check box near the name of the modifier. If you want to narrow the number of companies for the rating you can move the scroll and set its value to the needed position. The system also includes results of pilot project in Tomsk region for three industries: cement production, paper plants and bakery.

The system also includes the rating of the Russian regions by their energy efficiency. It is illustrated by an interactive map on which you can click to see the concrete figures for each region (all data is taken from official sources (Rosstat)).

If you want to read more about the methodology of the benchmarking, please, refer to "Methodology" menu item, while in "Vocabulary" you will find explanation of all terms used in the research.

If you still have any questions, please, feel free to fill in feedback form in "Contact". We hope that your work with our system will be pleasant and productive.

In order to get access to all functionality of the system, please, click on [Register](#) or choose menu item Register from pull-down menu in the upper right corner of the page.

Automated information panel (follow <http://bench.setra95.ru/>)

- Identification of sample (number) of companies for displaying
- Construction of a general rating of companies
- Consideration of various indicators for sampling in homogeneous groups
- Construction of rating arranged by the years (2013, 2014, 2015)

Industry Bench Welcome, Тихон Ковешников

Home / Oil Companies / Analytics

Analytics

Q Energy Efficiency

Oil companies efficiency fully adjusted for 2013, 2014, 2015 years

Q Production Range

Years

2013 2014 2015

Companies in range 1 - 50

Q Calculation Settings

Use debit ON

Use watering ON

Use depth ON



Identified problems

- Confidential treatment of information
- Poor awareness of Russian enterprises on energy efficiency benchmarking and its benefits
- Insufficient quantity of metering devices tracking consumed energy resources in some sectors of industry
- Low corporate culture at some enterprises, significant delays in the terms of submitting original data

Main results of the work for development of the national ranking system

- The optimal approaches and principles to the development of such system in Russia were identified based on the analysis of experience in developing and introducing benchmarking systems
- A list of indicators and their sources were identified for building a database for industrial benchmarking in Russia.
- The principles and approaches to the development of databases were developed along with the methods of their verification.
- An optimal method for calculation of weighting coefficient of various factors was developed in order to construct homogeneous groups of enterprises.
- An optimal methodology for ranking of industrial enterprises was developed.
- A principle for the development of recommendations for energy efficiency enhancement based on the benchmarking results for individual industrial enterprises was identified.
- An approbation of suggested industrial energy efficiency benchmarking model was conducted by the example of four industries and more than 80 enterprises. An automated model was developed.

Next steps

In 2018 the State information system “Fuel and Energy Complex” will be introduced into full-scale operation, which will include the existing State information system “Energy Efficiency”.

The Russian Energy Agency put forward an idea to the Ministry of Energy of the Russian Federation to integrate the developed energy efficiency benchmarking system into the SIS “Fuel and Energy Complex” by the end of 2018.

Based on the results of energy efficiency benchmarking conducted in pilot industries, recommendations for amending legislative act of the Russian Federation and the regions of the Russian Federation with the aim to incentivize the participation of industrial enterprises in the energy efficiency benchmarking projects were developed. Review of these amendments is included into the plan of actions of the Ministry of Energy of the Russian Federation in 2018.

**Thank you for your
attention**