Problems of requirements implementation for the new environmental legislation in energy sector

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Abstract. In accordance with the new environmental legislation, the majority of large thermal power plants are classified as the 1st category facilities subject to the strictest environmental requirements. In particular, such enterprises should obtain integrated environmental permits and adopt the best available technologies. In addition, all objects of the 1st category must be equipped with an automatic system for the continuous monitoring and accounting of emissions. The paper analyzes the main methodological and technical problems encountered in the practice of enterprises in the transition to the new principles of environmental valuation and the implementation of the best available technologies, as well as proposes solutions to these problems. The necessity of the National standard development allowing to carry out the choice of the best available technologies for the concrete enterprise taking into account economic expediency of their introduction is shown. A generalized algorithm for determining the compliance of thermal power plants with the principles of the best available technologies in the framework of obtaining a comprehensive environmental permit is developed.

1. Introduction
In 2014, Russia adopted Federal Law 219-FZ [1], effectively reforming all environmental activities and, above all, changing the principles of environmental regulation for enterprises.

The new environmental legislation provides for, first of all, stricter environmental requirements for the 1st category enterprises, to which all thermal power plants (TPPs) with an installed electric capacity of 250 MW or more are assigned. This is enforced by Governmental Resolution No. 1029 [2] as of September 28, 2015, and concerns consuming both the main solid fuel and (or) liquid fuel, as well as consuming main gaseous fuel by power plants with installed electric capacity of 500 MW or more, that is, the majority of large power plants.

In accordance with the new environmental legislation, starting from January 1, 2019, all enterprises included in the list of 300 largest polluting enterprises, approved by the Order of the Ministry of Natural Resources and Ecology of the Russian Federation should start the procedure of obtaining a comprehensive environmental permit (CEP). It should be noted that this list includes more than 40 major energy facilities. For the majority of the remaining energy facilities attributed to the 1st category, obtaining integrated environmental permits will begin in 2022.
2. Problems of technological standards calculation

The key position in the list of documents that the company submits to obtain the CEP is the calculation of technological standards, that is, emission standards and discharges of pollutants per unit of time or per unit of production. Calculation of technological standards will be carried out by the enterprise for each object receiving CEP. Thus, before applying for the CEP, the calculation of technological standards for each TPP classified as the 1\textsuperscript{st} category should be carried out [3].

In accordance with the Russian environmental legislation, the development of technological standards is carried out based on technological indicators established for the industry in the relevant information and technical guide to the best available technologies. The main information-technical directory (ITD) of BAT for energy facilities is ITD 38-2017 «Fuel combustion at large plants for energy production » [4]. Process parameters for combustion of solid fuels specified in ITD 38-2017 are given in table 1.

Table 1. Technological indicators of BAT for power units during combustion of solid fuels, mg/nm\textsuperscript{3} under normal conditions (temperature 0\degree C, pressure 101,3 kPa), dry gas, oxygen content 6 \%

| Thermal power of hot water boilers, MW | Steam generating capacity of steam boilers, tons/h | Mass concentration of particulate matter in flue gases | Mass concentration of SOx in the flue gas | Mass concentration of NOx in the flue gas | Mass concentration of CO in the flue gas |
|--------------------------------------|-----------------------------------------------|----------------------------------------------------|---------------------------------|-----------------------------------|---------------------------------|
| Boiler installations entered on the projects approved till December 31, 1981 |
| from 50 to 100 | from 70 to 140 | 2000 | 5800 | 2500 | 400 |
| from 100 to 300 | from 140 to 420 | 2000 | 5800 | 2000 | 400 |
| over 300 | over 420 | 2000 | 5800 | 2000 | 400 |
| Boiler plants designed after 01.01.1982 and entered till December 31, 2000 |
| from 50 to 100 | from 70 to 140 | 1200 | 4000 | 1500 | 400 |
| from 100 to 300 | from 140 to 420 | 1000 | 4000 | 1500 | 400 |
| over 300 | over 420 | 900 | 4000 | 1500 | 400 |
| Boiler installations entered since January 1, 2001 |
| from 50 to 100 | from 70 to 140 | 450 | 1400 | 640 | 400 |
| from 100 to 300 | from 140 to 420 | 400 | 1400 | 640 | 400 |
| over 300 | over 420 | 350 | 1200 | 570 | 400 |

The Russian environmental legislation treats technological indicators as concentration of polluting substances, volume and (or) mass of emissions, discharges of polluting substances, formation of production and consumption wastes, water consumption and use of energy resources per unit of time or unit of production [1]. At the same time, as can be seen from table 1, in ITD 38-2017 technological
indicators mass concentrations, and, therefore, additional methods of recalculation of the established mass concentrations in technological standards are necessary.

Solving this significant methodological gap in the energy industry requires availability of the document having the status of national standard and allowing to convert concentrations approved in the technological standards. This should be done for each enterprise.

3. Readiness analysis of the industry switching to the best available technology (BAT)
The analysis of the state of the industry carried out in the works [3, 5] showed that the majority of energy companies are ready to implement the best available technologies and the transition to a new environmental regulation. At the same time, it should be noted that 10-15% of enterprises attributed to the 1st category do not currently meet the requirements of modern environmental legislation. For such enterprises, a draft environmental efficiency improvement programme should be attached to the application for the CEP.

It is obvious that the need to finance programs to improve environmental efficiency and reduce emissions to technological standards is particularly acute for the energy sector. At the present time National Research University "MPEI" in conjunction with Research Institute ‘Environmental Industrial Policy Centre’, developed a draft National standard containing a methodology cost assessment during the transition to BAT for the energy industry. The financing amount assessment required for the transition of energy enterprises to the BAT, in accordance with the developed methodology showed that such costs can amount about 90-100 billion rubles.

The National standard will also solve the problem of technological indicators conversion into technological standards, since the methods of conversion contained in the documents [5, 6] are not legitimate and the introduction of this National standard will give them the necessary legal status.

Another important issue that arises in enterprises in the preparation of documents for obtaining a comprehensive environmental permit is the choice of the list of BAT, which corresponds to the enterprise. Currently, there are no guidelines for the formation of this list and the procedure of conformity assessment.

The authors of the work recommend the following approach, which is based on extensive practical experience in this field:

1. Formation of the BAT list in accordance with the priority for energy industry directory ITD 38-2017 [4]. At the same time, at each stage of the technological process, it is necessary to distinguish, taking into account the scope of BAT, technical solutions implemented at the energy facility and corresponding to BAT, given in the reference book.

2. The conformity assessment was formed in paragraph 1 of ITD 38-2017 by establishing the presence of at least one implementation of the technical solutions of the corresponding BAT, at every stage of the process.

3. Consideration of the desirability of taking into account the provisions of cross-sectorial manuals such as:
   - ITD 8 «Wastewater treatment in manufacture of products (goods), performance of works and provision of services in large enterprises»;
   - ITD 17 «Disposal of production and consumption waste»;
   - ITD 20 «Industrial cooling systems»;
   - ITD 22 «Purification of atmospheric discharge (pollutants) in manufacturing of products (goods), as well as performing works and providing services at large enterprises»;
   - ITD 22.1 «General Principles of Industrial Environmental Monitoring and its Metrological Assurance».

4. The assessment of compliance additional (generated in paragraph 3) list of BAT cross-reference in the manner similar to paragraph 2.

4. Organization of automatic continuous emission monitoring system by energy enterprises
Another acute issue in the transition to new environmental principles is the necessity of equipping all energy enterprises of the 1st category with Automatic Continuous Emission Monitoring System
(ACEMS). In addition to the significant costs of such systems, companies have a huge number of questions in the ACEMS development concerning the formation of the list of measured substances, places of system installation, methods, etc.

Analysis of foreign and Russian experience in the organization field of TPP emissions control showed a significant time lag of Russia in the creation of ACEMS. The GOST (GOST - State Standard) R EN 15259-2015, introduced since July 1, 2016 mainly contains requirements for periodic measurements and does not allow regulating all stages of creation ACEMS [5]. In this regard, the National Research University "MPEI" with the participation of the Association "Council of Electricity Producers" have developed and adopted as the Preliminary National Standard (PNST) of the Russian Federation No.187-2017 «Best available techniques. Automatic systems for continuous control and metering of contaminants emissions from thermal electric power stations into atmosphere. General requirements» [6], which came into force on January 1, 2018. The PNST 187-2017 is the first document regulating all stages of ACEMS life cycle in Russia.

5. Conclusion
Thus, the authors of this work to ensure compliance of energy enterprises with the requirements of the new environmental legislation:

1. The draft National standard containing a methodology for assessing costs in the transition to the BAT in the energy sector and approaches to the recalculation of industry technological indicators in the technological standards of pollutants emissions from thermal power plants.
2. Define the algorithm of BAT list forming to which technological process of the enterprise should be adjusted, and sequence of actions when carrying out the assessment of this compliance.
3. Developed the Preliminary National Standard PNST 187-2017, which will allow a significant easing deployment ACEMS TPP and to reduce the effort and time to develop such systems.

6. References
[1] Federal law №219-FZ of July 21, 2014 “About modification of the Federal law “on environmental protection” and separate legal acts of the Russian Federation”
[2] Decree of the government of the Russian Federation №1029 of September 29, 2015 "On approval of criteria for the classification of objects having a negative impact on the environment to objects of categories I, II, III and IV”
[3] Kondrateva O E, Roslyakov P V, Borovkova A M and Loktionov O A 2018 Ecology and Industry of Russia vol 4 (Moscow: Kalvis) p 41-45
[4] Information-technical directory of BAT ITD 38-2017 “Fuel combustion on large plants for production of energy”
[5] Organization standard OS 153-34.02.304-2003 “Guidelines for the calculation of emissions of nitrogen oxides with flue gases from boilers of thermal power plants”
[6] Guidance document GD 34.02.305-98 “Method of determining the gross emissions of pollutants into the atmosphere from boiler plants TPP”
[7] Roslyakov P V, Kondrateva O E and Borovkova A M 2018 Teploenergetika 5 85-92
[8] PNST 187-2017 “Best available techniques. Automatic systems for continuous control and metering of contaminants emissions from thermal electric power stations into air. General requirements”