

THE BEST AVAILABLE TECHNOLOGIES A MODERN INSTRUMENT OF ENERGY EFFICIENCY INCREASE AND DECREASE IN THE NEGATIVE IMPACT OF POWER ENTERPRISES ON ENVIRONMENT

ABSTRACT

The paper includes description of the basic principles and propositions of ecological standardization system accepted in EU, analysis of the European practice in development of documentation on the best available technologies (BAT), suggestions on nature protection legislation harmonization in EU and Russia relating to power objects.

1. INTRODUCTION

The current Russian system of environmental impact standardization is characterized by the low efficiency of its application and has a deeply fiscal character. Mostly it doesn't meet views of the government authorities, industrial enterprises of different branches of economy, including the power sector. In the nearest years in accordance with the RF President's Order 889 "On Some Measures for Increase of Energy Efficiency and Ecological Effectiveness of the Russian Economy" dated 04.06.2008, considerable changes in nature protection legislation of the country are provided. Realization of these changes will result in a transfer to the new principles of environmental impact standardization, introduction by economic entities of economic mechanisms of energy safe and environmentally sound technologies and increasing of responsibility for non-observance of technological standards.

In the basis of the mentioned changes there are principles and propositions of ecological standardization system, introduced in the territory of European Union by the Directive of EU Assembly 96/61/EU dated 24.09.1996 "On complex control and prevention of pollution (CCPP)". One of the key elements of this system is a complex approach to the ecological assessment of pollution objects, and one of the basic principles is to stimulate BAT application while issuing of the nature protection permission on industrial object operation. For practical realization of the mentioned Directive, from 1997 to 2006 EU research centre in Seville with the participation of experts has developed 33 reference documents. One of them was a Reference Document on the Best Available Techniques for Large Combustion Plants (BREF LCP) [1] – a reference book on BAT for large fuel-fired plants with heat capacity of more than 50 MW which has been developed for several years and accepted in July, 2006. The reference book covers description and indicators of energy and ecological efficiency of BAT, used for power objects. In 2009 under the contract with NP "INVEL" the reference book was translated into Russian [2] and analysis of the European practice of development and agreement of the mentioned document was fulfilled. While analyzing a number of problems concerning identification of BAT both for operating and new objects, appeared. Besides, the opinion was made that direct adoption and appliance of principles and propositions of EU ecological standardization system in the Russian power sector can be insufficiently effective. Basic results of the present work, including proposals on harmonization of nature protection legislation of EU and Russia are described in this paper.

2. ECOLOGICAL STANDARDIZATION IN EU

2.1. Basic principles of ecological standardization system in EU

In EU current system of ecological standardization is based on the following principles.

1. First of all, it is a principle of pollution prevention. Taking into consideration that until today we can't fully and exactly foresee the results of economic activity effect on environment, it is necessary to reduce the levels of man-made impact as much as it's technically achievable and economically possible, and not stopping at the level which meets the standards of environmental quality.

2. An industrial object is considered as an integral whole, in which every significant technology change may change the levels of environmental impact. Application of different and uncoordinated approaches to standardization and control of pollutants emitted into atmosphere, discharges into water or soil contributes in faster transfer of pollutants between different natural environments rather than in environmental protection as a whole.

3. Ecological safety of production should be provided at all stages of production object lifetime, including the stages of design (at this stage the basic ecological characteristics of the object are put in and nature protection measures are the most effective here), construction, operation and emergency modes, start-ups and stops, decommissioning.

4. Achievement of the goal of sustainable development stipulates a necessity of better and more rational utilization of the consumed natural sources and raw materials. A priority shouldn't be given to measures "at the pipe end" (cleaning plants, ESPs and DeNOx installations), it should be given to measures preventing from pollution. This principle transfers ecologists' attention from their traditional objects (cleaning plants) directly to production technological objects, since losses and pollutants are formed there. And exactly in changing of production technologies there are opportunities of more rational use of natural sources.

2.2. Basic points of ecological standardization system in the EU

Based on the mentioned above principles, a new system of ecological standardization in EU was formed, principal provisions of which cover the following.

For the certain types of industrial objects (the most potentially ecologically dangerous, a complete list of which is shown in appendix to Directive) instead of separate permissions for different types of impact, a single complex ecological permission is introduced. In this permission all the measures, necessary to insure a high level of environmental protection as a whole (of all natural environments), should be listed, including efficiency levels of energy, water and raw materials consumption. A list of substances, emissions and discharges of which are regulated by the permission, are also restricted and shown in the appendix. Limitation of the list of standardization objects and their ecological parameters al-

lows to focus the efforts and sources on to the most important directions. Together with traditional indicators – amount of emissions and discharges, indicators of energy efficiency and efficiency of raw materials consumption were introduced (use of pollution prevention principle).

Maximum values and parameters of emissions or corresponding technical measures, mentioned in the complex permission, must be defined “on the basis of the best available techniques”, without instruction to use the certain technique or method, but considering technical characteristics of the corresponding object, its geographical location and local environmental conditions. In all cases conditions of permission establish the requirements for reduction of trans-boundary pollution and provision of a high level of environmental protection as a whole. It should be mentioned here that the permission doesn't order the certain technique to be applied, but limits the level of environmental impact and consumption of resources. Bodies, issuing the permissions, are free enough to define permission conditions, and at this there's no unified algorithm for definition of BAT application. Estimation of regulatory authorities is a decisive element of the licensing process. It should be noted that for this a rather high level of technical knowledge of regulative authorities is supposed.

For setting the impact standards at practically achievable technical level it's needed to define these levels. Therefore, the Directive introduced a procedure of developing the BAT reference books, the main purpose of which is to form a list of BAT, indicate a destination and a scope for these techniques, and define the level of ecological indicators, meeting these BAT. The term “the best available techniques” is defined in the Directive as “the most effective and advanced stage in development of activity types and methods of their operation, showing a practical suitability of the certain technologies to meet the limit emissions, developed for prevention and, in case it's practically impossible, to reduce emissions and environmental impact as a whole”.

It's important to underline, that the best achievable impact levels, connected with BAT application, have their practical value for a process of standardization, but not the list of techniques, acknowledged by BAT itself. BAT list only bases and confirms achievement of these levels. In addition, setting the compulsory standards on the basis of BAT does not cancel the requirements for meeting the environmental quality standards. It means that a procedure on estimating the dispersion of emissions and discharges in order to test for non-exceeding of maximum permissible concentrations, is held.

It should be also noted, that by some ecological aspects it is impossible not only to come up to the shared vision concerning BAT and impact levels corresponding to them (that is confirmed by special opinions mentioned in the reference book), but also to identify BAT in general. For example, it fails to identify BAT for methods preventing fish death in water intakes (Reference book for industrial cooling systems). It does not mean that there are no such methods. But in spite of different methods being applied, none of them can be considered to be the best to apply as it's required according to the Directive, because in each specific case the local conditions make significant influence on selection of the fish protection method.

Besides the basic information the reference books include rather a lot of review and introductory branch information, describe in detail a process of BAT selection from the whole list of technologies applied, have descriptions of the specific examples of BAT application, specific opinions of members of the working group. Therefore, as a summary of the reference book, which includes the basic information, can make

20-30 pages, the total volume of the reference book can make hundreds of pages. For example, the BAT reference book for large fuel-fired plants contains more than 600 pages.

3. OPPORTUNITIES AND CONDITIONS OF APPLICATION OF EU EXPERIENCE ON ECOLOGICAL STANDARDIZATION IN THE RUSSIAN POWER SECTOR

3.1. Standard-methodical and informational support of harmonization of nature protection legislation in EU and Russia

Federal Law “On Amending the Federal Law “On Technical Regulation” ratified on 23.12.2009 by the State Duma of the RF and approved on 25.12.2009 by the Council of Federation of the RF, provides an opportunity of recognition and adoption of international standards for their application in Russia and also introduction of two modes of technical regulation applied according to the applicant's choice, one of which is based on the Russian requirements for standards and another one - on foreign requirements. Two approaches to permission of the foreign standards for their application in Russia are introduced by amendments: a permissive approach - registration of the standard by the national standardization body; a notifying one - accounting of the standard in the federal informational fund of technical regulations and standards.

Under direction of the Committee for natural sources and environment of the Council of Federation of the RF in November, 2008 the model law “On complex nature management, pollution prevention and control resulting from economic activity” was developed and approved for the CIS countries. This law is based on propositions of the corresponding EU Directive. A basic essence of the model law is issuing the complex natural protection permissions on the basis of the best available techniques.

Significant work on analyzing the opportunities of introduction of the new European ecological standardization system was conducted by experts of the project “Harmonization of ecological standards”, in frames of which a review of the EU and Russian requirements in part of licensing of emissions, discharges and waste landfilling was prepared, the concept of BAT application was considered, a number of the reference documents of EU was translated into Russian including “BAT of energy efficiency provision”. Different documents of the mentioned project, including a brochure “Russia on the way to the integrated pollution prevention and control (IPPC)”, are shown on the site: www.ippc-russia.org.

During 2010 adoption of a number of the most important standardized documents, including the Federal Law “On amending separate legislative acts of the Russian Federation (in part of improvement of standardization in the field of environmental protection and introduction of economic stimulation measures of the economic entities for implementation of the best techniques)”. A practical realization of this legislative act will lead to a transfer to the new system of technological standardization on the basis of BAT; setting of target indicators of ecological efficiency; considerable increase in payments for exceeding the limits of permissible environmental impact.

3.2. Basic principles of technical policy in the field of ecology in power engineering

Due to financing by the Open JSC RAO “UES of Russia” the leading experts from MPEI and branch institutes have developed “The basic propositions (A concept) of technical policy in power engineering for the period to 2030” [3] and

informational collection “State-of-the-art natural protection technologies in electric power engineering” [4]. The mentioned collection includes the detailed description of the best national and foreign technologies of power generation and the detailed information on the almost all actual ecological problems in the power industry: protection of atmospheric air from emissions of power enterprises; protection of water basin from emissions of power enterprises; handling ash and slag from TPPs; complex technology of reduction of environmental pollution by TPPs; decrease in physical factors impact from power objects on environment; perspective techniques and power installations for thermal and electric energy generation; energy saving; renewable sources of energy (RSE).

In [3] the main purposes and tasks of technical policy are formulated in a context of the target vision of energy strategy development to 2030, the policy in the field of electric power systems, thermal engineering, heat supply, hydro engineering and hydro technical plants, RSE, electric equipment was stated. A separate part of the document was devoted to the technical policy in the field of ecology in power engineering, in which the following basic principles of this policy were listed:

- application of typical technical and technological measures to provide ecological safety of power objects;
- differentiated approach to the power objects under operation and design;
- BAT application while construction of the new power enterprises and reconstruction of the operating ones;
- selection of new sections lines of hydro power plants (HPPs) in respect of ecological well-being of the region;
- provision of biodiversity conservation priority and protection of the specially protected natural sites while designing and locating the new hydro power plants;
- insuring the full and duly compensation of damage to water biological resources;
- combination of general systematic and technological nature protection measures.

General systematic measures include:

- application of new and more effective technologies of power generation on the base of organic types of fuel, providing significant reduction of fuel consumption on power generation and negative environmental impact;
- construction of typical serial power units at nuclear power plants (NPPs);
- improvement of the TPP fuel balance structure due to less burning of the fuels with high ash and high sulfur content;
- optimization of a structure of generation capacities (TPPs, HPPs, NPPs and RSE) considering environmental condition in the places of their location.

Therefore, a basic direction of the technical policy in the field of ecology in power engineering for the period to 2030 for the objects being designed is BAT introduction. It results to achieve by 2030 a compliance between the technological standards and parameters of ecological efficiency of domestic power installations and the similar parameters at the EU objects.

3.3. Recommendations on introduction of the technological standards on the basis of BAT at the Russian TPPs

Considering the EU experience, the technical standards should reflect the coordinated opinion on a level of impact of technological installations of the certain type, being technically achievable and economically reasonable at the modern stage.

For every industry the type of standards can be different: a mass of pollutants referred to the unit of production or raw material consumption in those cases when the pollution ex-

tent is proportional to the volumes of production. Relating to TPPs as technical (technological) standards, for example, of pollutant emissions, it is reasonable to use the following parameters: kg/MJ, kg/t ref. fuel, mg/m³.

Relating to TPPs under the term “technology” the technological installation for power generation is understood, for example, with coal-fired boiler, ESPs or fabric filters. It should be not only the best technology considering all ecological indicators at the same time, including power efficiency and resource consumption, but it should be also available taking into account all the expenses and benefits. It is availability of the recommended technologies which should consider the operators’ interests and provide feasibility of the requirements.

Technological standardization on the basis of BAT should be compulsory used only for the new power objects (power plants, power units, separate aggregates), and the lifetime of the complex permissions can be equal to the project term of the object operation. An opportunity of changing the compulsory ecological requirements for the object must be foreseen only in case of federal legislation change. Investor is to be sure that during payback period the conditions will not be radically changed. It is especially important for such a comparatively low-profitable industry as power engineering.

For the operating objects and at their reconstruction principles of technological standardization on the BAT basis should have a recommendation character, i.e. standards of environmental impact should be set in accordance with the principles of sanitary-hygienic standardization. Operating objects, which do not satisfy sanitary-hygienic requirements, must be decommissioned.

It is necessary to use the European experience of applying the standardization procedures of different complexity for large, middle and small enterprises, and limiting the list of adverse effect regulated by the state. Gaining of individual permissions is reasonable only for large enterprises, but middle and small ones should meet the general standards without any need to gain specific permissions. It allows to the state and users of natural resources to concentrate their attention on the actually important ecological problems, simplify a procedure of gaining the ecological permissions for users natural resources due to possible application of “one contact” principle.

Reference books on BAT are certainly useful documents, giving to the all interested layers of our society the general characteristic of the technological level of industries and contain information on the most progressive applicable technologies. Reference books on BAT should be used while setting the technical ecological standards. It is important to underline the fact, that they are not the dogma and do not establish direct standards. Reference books are socially acknowledged platform to agree positions of industrial enterprises and society at issuing of the complex nature protection permissions.

In connection with this it is reasonable to develop and include the reference books on BAT in the Russian system of national standards or codes of rules with the status of recommendation documents. For the industry it is very important to develop the Russian reference document “The best available technologies in power engineering” on the basis of using [1-4] and the State Standard GOST R 50851-95. “Boiler plants. Thermal and mechanical equipment. General technical requirements”.

By this the actual point is creation of new educational materials on the basis of BAT reference books and development of recommendations on application of the main BAT indicators while planning of investment activity in power sector.

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