

Electronic Information Systems of the Open Access for Effective Solution of Both Environmental and Coal Ash Utilization Issues

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ABSTRACT

The purpose, direction and objectives of creating the information systems of the open access for effective solution of both environmental and coal ash utilization issues are stated. Prerequisites of creating at the National Research University "MPEI" the "Informational Electronic Constantly Updated Open System "The Best Available and Perspective Nature Protection Technologies in the Russian Power Industry" (hereafter referred to as the System, <http://osi.ecopower.ru>) are presented. A structure of the System is shown. Requirements for a format of materials to be placed in the System are stated. Possible financial options for updating and developing the System are presented.

INTRODUCTION

For effective solution of environmental problems in power engineering, including utilization of ash and slag from thermal power plants the following is required:

- state policy in the field of environmental protection, allowing to stimulate the solution of environmental problems and, in particular, to address coal ash utilization issues;
- complete complex of legal and technical documentation in the field of environmental protection and coal ash utilization and its compliance to the modern requirements;
- the best available nature protection technologies in power engineering being the advanced experience for its introduction at the power objects;
- qualified experts in the field of environmental protection, as well as in coal ash utilization;
- information support of the nature protection activity and coal ash utilization.

Information support of the nature protection activity in power engineering is subdivided into external and internal. The internal information support, called as intra corporate, is arranged by the organizations themselves and is a separate big subject, therefore it's not a subject under consideration. Later on various aspects of external information support will be considered.

Main objective of information support of the nature protection activity in power engineering is creation of one of the main necessary external conditions for development and realization of effective ecological policy of power companies and utilities¹.

A compulsory condition of the most objective external information support of the nature protection activity in power engineering is carrying out system researches on development and application of nature protection equipment and technologies in both power generating and electric grid companies and enterprises in the countries worldwide, and use of results of the analysis in various directions of external information support.

Directions of external information support of the nature protection activity of power utilities:

1. creation and update of electronic information systems of the open access in the field of nature protection technologies in power engineering;
2. preparation, professional development and professional retraining of experts in the field of nature protection;
3. creation of educational, methodical and information electronic and printing materials;
4. holding and participating in the Russian and foreign international scientific and practical conferences and workshops.

The main objectives of external information support of nature protection activity in power engineering are as follows:

- online acquaintance of any Russian or foreign user with the constantly updated information on development, introduction and use of nature protection equipment and technologies in the Russian power sector and all over the world;
- creation and continuous updating of information environment according to the modern requirements for development and implementation of programs for preparation, professional development and professional retraining of employees of operating, design, scientific, supervising and other enterprises and organizations in the field of nature protection technologies in power engineering;
- promotion to Russia the best world available technologies in the field of effective solution of environmental problems;
- increase in efficiency of carrying out system researches on ecology in power engineering by the Russian and foreign experts;
- information exchange on ecology in power engineering between the Russian and foreign experts;
- support in building cooperation between the Russian and foreign companies and experts;
- formation of a favorable image of Russia in the countries worldwide relating to environmental protection due to maximum open objective informing the world community on activity of the Russian power companies on solution of ecological problems in power engineering and use of by-products from combustion of organic fuel replacing the natural raw materials.

1. PRE-CONDITIONS OF CREATING THE OPEN SYSTEM OF INFORMATION IN THE NATIONAL RESEARCH UNIVERSITY "MOSCOW POWER ENGINEERING INSTITUTE"

1.1. Non-compliance of knowledge of the personnel of power companies and specialized organizations in nature protection technologies to the modern requirements

In 1997 a Center for improvement of professional skill and professional retraining "Ecology in Power Engineering" (CPPEE MPEI) has been established in MPEI. The base department is Boiler Plants and Ecology in Power Engineering Department.

The main reason of CPPEE MPEI creation was insufficient qualification of the personnel of power companies, operating coal-fired power plants, as well as the staff of design and other specialized organizations of the energy sector in application of the modern environmental technologies, taking into account world experience. At introduction of new techniques and technologies MPEI employees in some form trained the operational personnel. Therefore, MPEI administration decided to establish CPPEE MPEI at the suggestion of Boiler Plants and Ecology in Power Engineering Department.

Courseware. In accordance with the state educational standard, the training center should have the necessary education materials in frames of the curriculum. Unfortunately, at that time there were no materials, which would completely correspond with the modern requirements, covering various aspects of environmental activity in energy sector. In 2003 MPEI Publishers issued the manual "Ecology in power engineering"², intended for implementation of advanced training and professional training programs in the field of ecology in power engineering. It was intended for the personnel of enterprises and organizations of the Russian JSC "UES of Russia" (RAO "UES of Russia"), Fuel and Energy Complex, Municipal and Community Services and other sectors and agencies. The basis for the manual made education materials, developed during 1998-2003 by the leading Russian experts - CPPEE MPEI teachers and intended for programs of training and professional retraining of personnel of RAO "UES of Russia" utilities and other economic sectors under specialties "Thermal power plants," "Electric power systems and networks" and "Electric plants".

Since 1998 till 2012 in CPPEE MPEI 675 employees were trained and 265 employees of power companies and specialized organizations of the energy sector were retrained. However, despite of the fact that CPPEE MPEI activity is certainly useful, it does not solve the whole problem of compliance of the power industry staff qualification in the field of nature protection technologies and coal ash utilization with the modern requirements.

1.2. A need for continuous conducting the system researches in the field of nature protection technologies in power engineering and coal ash handling

The main reason for creating in 1999 of the Information and Analytic Centre "Ecology in Power Engineering" (IACEE MPEI) was a need for conducting the system researches

on development and application of nature protection equipment and technologies, as well as coal ash handling in power companies of Russia and countries worldwide and use of results of their analysis in various directions of external information support.

IACEE MPEI main activities:

- carrying out system researches relating to various environmental issues in power engineering and, in particular, coal ash utilization;
- creation and continuous updating of information environment in the field of nature protection technologies in power engineering and coal ash utilization, according to the modern requirements;
- organization and holding the scientific and practical conferences and workshops on ecology in power engineering and coal ash utilization.

In 2007 by results of IACEE MPEI system researches MPEI Publishers issued the information collection “The state-of-the-art nature protection technologies in electric power engineering”³ prepared by the leading Russian experts. The information collection was prepared and edited according to the Program of ecological policy implementation of RAO “UES of Russia” in 2006-2007. It contains the data on domestic and foreign nature protection technologies which applied or can be applicable in power industry of Russia for decrease in the man-made impact on surrounding environment from the enterprises producing, transporting and distributing electric and thermal energy.

Activity on creation and edition of similar printing works has been proceeding rather a long period of time, during which some materials can undergo essential changes or become outdated at all. It is a natural lack of similar printing editions.

2. ABOUT CREATION OF THE OPEN SYSTEM OF INFORMATION

One of the possible examples of informing the public about the best available state-of-the-art nature protection technologies, and also technologies of beneficial use of ash and slag from power generation is creation of the *Information Electronic Constantly Updated System of the Open Access “The Best Available and Perspective Nature Protection Technologies in the Russian Power Industry”*. MPEI administration when working out the program of MPEI development for 2010-2011 included our proposal on creation of the System (<http://osi.ecopower.ru>) in Russian and English. The work on its creation was completed in 2011. IACEE MPEI managed implementation of the project. It should be noted that the section "Ash handling" of the System is a part of the Worldwide Coal Combustion Products Network (WWCCPN)⁴.

The sources of Information used for the System are as follows:

- results of the system researches in the field of ecology in power engineering and coal ash utilization;
- information collection “State-of-the-art nature protection technologies in electric power engineering”;
- Russian and foreign legal, normative and technical documents;

- proceedings of international and Russian scientific and technical conferences and workshops;
- reports of power companies relating to the nature protection activity;
- publications in printed and electronic mass media.

When creating the System is was provided to adjust and place the new materials in the existing sections, and also add new sections or blocks with minimum financial and labor expenses.

The System allows the following:

- provides the online open access of any Russian and foreign user to all materials downloaded in the System; the only condition is registration;
- promotes the best nature protection technologies in power engineering and coal ash utilization technologies to Russia;
- provides an information basis for increase in efficiency of using financial, material and human resources when solving the issues relating to improvement of ecological and economic indicators at construction of the new and modernization of the operated power enterprises;
- contributes in improvement of a quality of preparation, professional development and professional retraining of experts in design, construction and operation of power utilities in the field of environmental protection and coal ash handling;
- promotes information exchange in the field of nature protection technologies and equipment, and also coal ash utilization between the experts of the whole world;
- contributes in formation of an objective image of Russia in the field of environmental protection in power industry.

BRIEF DESCRIPTION OF THE SYSTEM

Structure of the Open System of Information

Main block: “Nature protection technologies”:

- Full content;
- Air protection;
- Water protection;
- Ash handling;
- Complex technologies;
- Factors of physical impact;
- Advanced technologies;
- Energy saving;
- Renewable energy sources.

Block: “News”

- Global news
- News

Sections:

- General issues;
- Conferences
- Events
- Partners
- Financing of the System
- Contacts

Contents of all the sections and materials of the System can be available in the open access without any restrictions. The main objective of the System creation is reflection of results of system researches of domestic and foreign experience in solution of environmental problems in power engineering and addressing the coal ash utilization issues in the constantly updated system.

Results of creation and maintenance of the System:

- online familiarization of any Russian or foreign user with the constantly updated information on the best available nature protection technologies including the coal ash handling issues in Russia and countries worldwide;
- open information exchange in the field of nature protection technologies and, in particular, coal ash utilization between the Russian and foreign experts;
- easy access of students of educational institutions, listeners of programs of professional development and professional retraining, pupils and other groups of the interested users to the best world experience in the field of environmental protection technologies and coal ash handling.
- forming the objective image of Russia in the countries worldwide regarding activities on improvement of environmental quality in a zone of impact of coal-fired power plants and boiler-houses.

3. REQUIREMENTS FOR SUBMISSION THE MATERIALS AND A FORMAT OF REPRESENTING INFORMATION IN THE SYSTEM

For forming an objective opinion on advantages and disadvantages of the state-of-the-art best available and advanced nature protection technologies applied or proposed for application in power engineering, the minimal required data are as follows:

1. ***A name of the technology (analytical material or normative-technical document)*** should reflect its essence, be brief and precise.
2. ***Description of the technology (analytical material or normative-technical document)*** should be brief under the text and contain a minimum quantity of schemes (Figures), an essence of the technology (analytical material or normative and technical document) sufficient for understanding without disclosing the KNOW-HOW and the data, making a trade secret.
3. ***Full text of the normative-technical document*** should be resulted without changes, as in the primary source.

4. **Type and capacity of power-generating equipment** at which it is recommended or possible to apply the considered technology. Here types and passport capacities of power-generating equipment, where technologies are introduced, are specified. It's required to separately specify the power-generating equipment, where application of these technologies is possible, and also mention necessary conditions for their implementation.
5. **Scope of the technology (normative-technical document)** should precisely contain the specified limits.
6. **Technology application restrictions.** Here restrictions, revealed during implementation and operation, both skilled, and industrial, are specified. There can be recommendatory data resulted, as well.
7. **Advantages and disadvantages of the considered technology.** This part contains data on change of parameters before and after implementation of the technology:
 - technological (specific parameters of the fuel rate for electric and thermal energy generation, reliability, efficiency, a warranty period of maintenance, etc.);
 - economic (the cost price of thermal or electric energy generation, expense or change of expenses per unit of coal combustion by-products handling, etc.);
 - ecological (environmental effect at the power plant site and at the zone of power plant impact, use of natural resources, etc.);
 - social (improvement of working conditions and decrease in the personnel traumatism; creation of new work stations in the zone of power installation arrangement, etc.);
 - other parameters describing application of the technology.
8. **Installations of technology implementation.** Here legal names of power enterprises (branches), numbers or names of equipment accepted at the power enterprise and other data, allowing to identify a place of technology introduction, are specified.
9. **Data on copyright protection of the applied technology, developers and/or legal owners of technology.** As developers or legal owners of the technology or separate key developments used in the considered technology, both organizations and natural persons can be specified that should follow from patents, utility model certificates or other resulted documents.
10. **Data on developers.** Developers of the document should be specified in normative-technical documents.
11. **List of information sources.** As information sources there can be used scientific and technical mass-media, printed and electronic; instructions of manufacturers approved in accordance with the established procedure, normative-technical and other documents, specifying full output information, using which the information source can be defined.

12. The author (authors). At the end of the paper it is necessary to specify the author (authors), a place of their work, scientific degree, contact data (phone, fax, e-mail).

Selection of information for updating the System

Materials, submitted for their placing in the System, are selected by the Editorial Board, formed from the authoritative experts in various directions of nature protection activity in power engineering and coal ash utilization. A list of members of the Editorial Board is available at: http://osi.ecopower.ru/images/stories/redkolleg_eng.pdf.

Copyright

To avoid possible confusion with regard to protecting one's copyright to the data from the papers, placed in the System, the authors of materials submitted to the Editorial Board, represent a mandatory permissions for publication. In the permission among other things they write that "... by giving permission to place the above mentioned papers in printing and electronic Media, we are taking the complete responsibility for the absence of information being of a trade secret or know-how of the presented technologies".

4. FINANCING OF THE SYSTEM

The main problem, associated with operation of the System, is financing the system research on ecology in power engineering and coal ash handling and reflecting the results of research, conducted by the leading experts in this field, i.e. financing of the System maintenance. Further conducting the researches in this area is to be carried out by the leading experts. For productive work of the Editorial Board of the System funding is also required. Possible options for information access and corresponding sources of funding are the following:

Option №1.

Access: *paid for all groups of users.*

Sources of funding: *budget and off-budget funds of the Ministry of Energy, Ministry of Education and Science, Ministry for Protection of the Environment and Natural Resources and Ministry of Regional Development*

Validity of the option: *all of us are taxpayers and we have the right to know that it is necessary to do to minimize the technically achieved impact of power generation facilities on environment!*

Reality of the option: *till 2010 it was unreal. Since 2010 financing was effected only according to the Program of MPEI development. Ministry of Energy, Ministry for Protection of the Environment and Natural Resources and Ministry of Regional Development didn't co-finance the System.*

Option №2.

Access: *two-level (free and paid groups of users).*

Sources of funding: paid groups of the System users - organizations irrespective of form of their ownership, and individuals.

Validity of the option: contradicts the right for access of each member of the global community to information on problems of the mankind survival!

Reality of the option: this option has no right to implementation!

Option №3.

Access: free for all the users.

Sources of funding: basic and additional.

Basic sources of funding: budget and off-budget funds of the Ministry of Energy, Ministry of Education and Science, Ministry for Protection of the Environment and Natural Resources, Ministry of Regional Development and regional ecological foundations.

Additional possible sources of funding: environmentally responsible organizations wishing to participate in respective rankings.

Reality of the option: rather high, first of all, at responsible attitude of heads of the Ministry of Energy, Ministry of Education and Science, Ministry for Protection of the Environment and Natural Resources and Ministry of Regional Development.

Option №4.

Access: free for all the users.

Sources of funding: basic and additional.

Basic sources of funding: budget and off-budget funds of the Ministry of Energy, Ministry of Industry and Trade, Ministry of Education and Science, Ministry for Protection of the Environment and Natural Resources, Ministry of Regional Development, regional ecological foundations and funds from environmental programs of power companies.

Additional possible sources of funding: specialized firms wishing to participate in the respective rankings, funds and donations from environmentally responsible organizations, ecological foundations, and individuals.

Reality of the option: highest at responsible attitude of executives of the Ministry of Energy, Ministry of Education and Science, Ministry for Protection of the Environment and Natural Resources and Ministry of Regional Development, power companies and regional ecological foundations, but also at the financial support of other environmentally responsible organizations, enterprises and foundations, regardless of their ownership.

Comments on possible funding sources. Some companies are willing to place information about their technologies, which is advertising, in essence, and they are ready to pay for it, and even maybe quite a nice sum. However, we are not an advertising agency and will not under any circumstances use this source of funding. Our goal consists in maximum objective informing of all users about the best available environmental technologies in power engineering, and any advertising - it is big or small lie! Thus, we believe that the financing option # 4 is the most correct.

There is currently no any certainty in further sustainable funding of the System, although in 2012 the situation with funding started to change for the best. In 2012 for maintaining the System environmentally responsible companied allocated 650 thousand rubles, including:

- *Omega Minerals Group* (Germany, 280,0 thousand rubles.);
- *OJSC “TGC-11”* (Russia, 200,0 thousand rubles);
- *CJSC “INET”* (Russia, 90,0 thousand rubles);
- *Beijing Guodian Futong Science & Technology Development Co., Ltd* (China, 80,0 thousand rubles).

5. CONCLUSION

1. Creation and functioning of the System is an effective information resource for realization of ecological policy of power companies because of the following reasons:

- it allows to have an access of all the interested persons to objective information relating to the world experience of application of the best available nature protection technologies in power engineering and coal ash utilization;
- it allows to make a conscious choice at decision-making taking into account all aspects of introduction and use of the best available nature protection technologies in power industry of Russia and other countries worldwide, instead of wasting time looking through the advertizing brochures;
- it allows to reduce a risk of unreasonable financial expenses for development of already known technical solutions;
- it contributes in improvement of the required skill level of experts in the field of nature protection technologies and coal ash utilization when training in educational Centers, and intra corporate.

2. The System should have an open access as environmental preservation is a global national problem, and preventing to any interested person in obtaining the most objective information about possible decrease in man-made impact from the power sector on environment it is a crime against humanity.

3. Effective solution of the System financing problem is possible only at responsible attitude of heads of the Ministry of Energy, Ministry of Education and Science, Ministry for Protection of the Environment and Natural Resources, Ministry of Regional Development and heads of power companies and regional ecological funds, and also financial support of other ecologically responsible organizations, enterprises and funds irrespective of a form of their ownership.

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