Climate change and environmental protection: system approach of the Moscow Power Engineering Institute

Centre for Science and Education
“Ecology in Power Engineering”,
Moscow Power Engineering Institute

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Contents

Legal issues: Excerpts from the Decree of the President of the RF "On the Strategy of the Environmental Safety of the RF for the Period up to 2025"

clause 17 - an unfavorable environment is the cause of deterioration in health and an increase in mortality of the population, especially that part of it that lives in industrial centers and near production facilities

clause 18 - annual economic losses caused by the deterioration of environment, excluding damage to human health, amount to 4 ... 6 percent of the gross domestic product

Tasks of the Strategy

reduction or prevention of the negative impact from economic and other activities on the environment and rational use of natural resources

elimination of the accumulated environmental damage, restoration of degraded natural ecosystems

Research results

Methods for assessing the vulnerability of urban systems and population in changing natural and climatic conditions have been developed.

A comprehensive program for the development of the urban economy and the economy of Moscow to climate change has been determined.

The relationship between the mortality and morbidity rates of the megalopolis population and the consequences of climate change has been established.

A model for assessing the economic consequences of climate change for the Moscow region has been created.

The general patterns and features of the development of urban power systems in various socio-economic and natural-climatic conditions have been investigated.

The fundamental problems of the development of the Russian energy sector in the context of rapid global climate changes and their manifestations in the country have been investigated.

The potential of adaptation of the Russian energy sector to modern technological challenges in the context of climate change has been studied.

Comprehensive scientific, technical and methodological foundations have been developed for the creation and operation of automatic systems for monitoring emissions from TPPs.

The methodology for forecasting the volume and structure of energy consumption and greenhouse gas emissions in various sectors of the economy at the global and national levels under environmental and resource constraints has been further developed.

The models of the global carbon cycle and climate have been modernized.

Research results-2

Comprehensive studies to reduce the impact of noise from energy facilities on the environment have been carried out. Research is being conducted on the influence of climatic factors on these impacts.

A cycle of studies was carried out on the implementation of BAT at electric power enterprises; indicators were proposed for assessing the feasibility of such a transition, a methodology for assessing the costs of switching to BAT in the energy industry was developed (implemented in the form of GOST R 113.38.02-2019).

Methods for modeling the response and accident rate of power transmission lines of regional power systems to changing climatic conditions have been developed. A probabilistic model for accounting the influence of changes in extreme characteristics of weather and climatic conditions on the operating modes of power transmission lines of medium and high voltage classes has been formed.

The economic and social consequences of climate change for different sectors of the Moscow economy are calculated.

Applied methods considering the impact of changes in natural and climatic factors on the performance of energy systems have been developed.

A comprehensive analysis of the sources of noise impact on the environment was carried out, depending on the characteristics of power equipment, as well as the influence of climate.

Scenarios of energy consumption and carbon dioxide emissions were developed at the global and national levels.

Research infrastructure facilities

Instrumental and experimental base of the Department of Environmental Engineering and Labor Protection

Instrumental base and BAT database of the Centre for Science and Education “Ecology in Power Engineering”

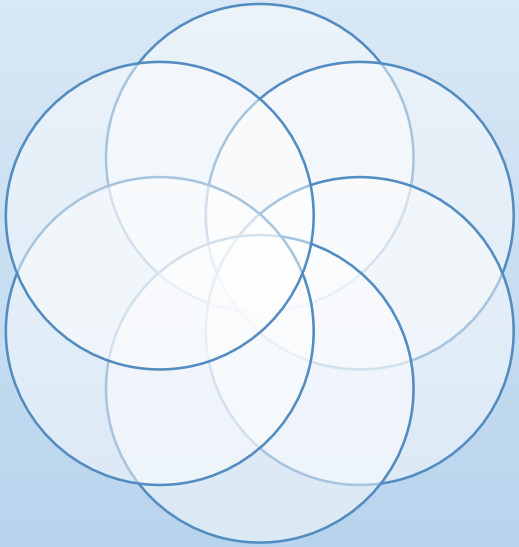
Center for Collective Use of Environmental Monitoring

Other databases and software systems that have received state registration

Main partners

Energy companies: PJSC "Mosenergo", PJSC "MOEK", PJSC "ENEL Russia", PJSC "Inter RAO"

JSC "VTI", JSC "VNIPIenergoprom"



Regional heating companies

RAS Institutes, MSU, MSUCE

Power equipment manufacturers

Large metallurgical companies

International partners and projects

Russian-German project "Climate-friendly economic activity: implementation of BAT in the Russian Federation" - German Society for International Cooperation (GIZ GmbH)

University of Bonn (Germany)

California Institute of Technology (USA)

Gorgan University (Iran)

World Wide Coal Combustion Products Network

European Coal Combustion Products Association

Educational disciplines of ecological orientation

- Ecology in Power Engineering
- Environmental technologies at TPPs
- Environmentally friendly technologies
- Technogenic safety in the electric power industry and electrical engineering
- Energy gas-air ducts
- Thermal power plants
- TPP: circuits, systems and units
- Water and fuel technologies at TPP and NPP
- Water and fuel technology in power engineering
- Energy heating technology
- Power supply of enterprises. High temperature technologies

Working with schoolkids

- Section "Ecology" in the open Moscow engineering conference of schoolchildren "Potential".
- Moscow city conference of schoolchildren on resource conservation.
- City festival of scientific and technical creativity of youth “Education. Science. Production".
- University Saturday "Technosphere safety in the urban environment" within the framework of "Moscow schoolchildren's Saturday".
- Conducting Olympiads and lectures.

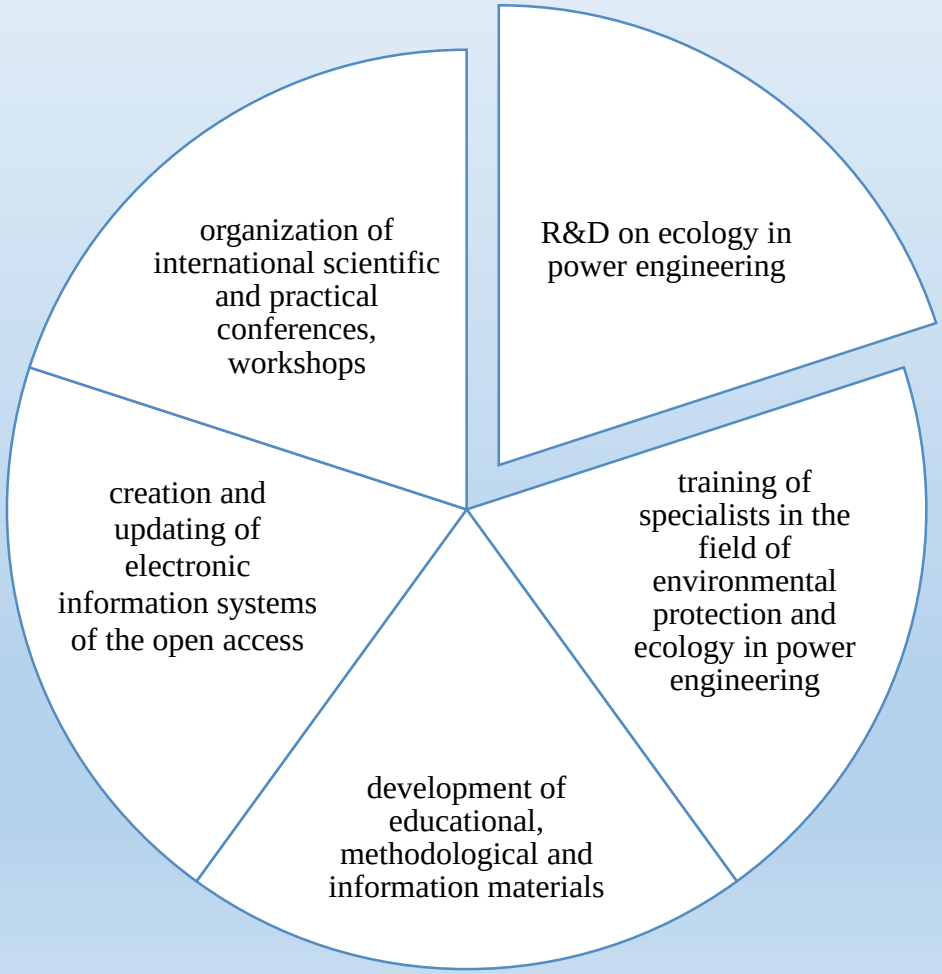
Other popularization activities in this area

- Presentations at different scientific and technical conferences, at the House of Scientists.
- Organization of the youth ecological movement "Green Generation".
- Issue of scientific and methodological materials.
- Media interview.

Experience of the Centre for Science and Education “Ecology in Power Engineering”

- R&D on ecological problems in power engineering and ash handling at TPPs
- advanced training and professional retraining of employees of energy enterprises

System approach in the field of ecology in power engineering



Research activities on coal ash handling:

- Development of normative and technical documentation for the replacement of natural materials with coal ash.
- Assessment of erosion of pneumatic conveying installations and working out recommendations on its reduction.
- Working out legal, normative and technical documentation on coal ash and on creation of reliable, cost-effective and ecologically sound ash and slag removal systems at TPPs.
- Assessment of technical, economic and ecological indices of ash and slag removal systems at TPPs; working out complex measurements for raising their efficiency.
- Working out and introduction of technical proposals on modernization of existing ash and slag removal systems and creating new ones with high technical, economic and acceptable ecological indices.
- Creation of level control systems for coal dust and ash in coal-dust bunkers and silos of coal-dust collecting and ash pneumatic conveying plants.
- Creation of level control systems for acid, alkalis, oil products and other liquids in TPP tanks.
- Sediment cleaning of coal ash lines and pipelines of clarified water of hydraulic ash disposal systems.
- Automation of ash pneumatic conveying plants under pressure.
- Development of locking and regulating armature for ash pneumatic conveying systems.
- Development of ash pneumatic conveying plants with the transportation distance up to the 3000 meters.

The scale of the coal ash problem in Russia

- The number of large coal-fired power plants - 148.
- 1.5 billion tons of coal ash accumulated
- The area of ash disposal sites - more than 20 thousand km^2.
- More than 2/3 of ash dumps have exhausted their design capacity, the rest - will have the lack of space in 10 years.
- Coal ash production is about 30 million tons / year
- Utilization is about 10%.

Results of educational work

- dozens of relevant professional development and retraining programs
- more than 1,500 listeners
- reference books, monographs, hundreds of teaching aids
- National environmental award for 2007 in the category "Education for Sustainable Development"


ДИПЛОМ

ЛАУРЕАТА КОНКУРСА
«НАЦИОНАЛЬНАЯ ЭКОЛОГИЧЕСКАЯ ПРЕМИЯ»
2007 год

Номинация «Образование для устойчивого развития»

ГОУ высшего профессионального образования
Московский энергетический институт


Благодарность
МЭИ

Путилову Вячеславу Яковлевичу

За большой вклад в развитие и поддержание партнерских связей с целевыми заказчиками, продвижение программ профессиональной переподготовки в группы компаний ПАО «Газпром»

Директор ИДДО Т.А. Шиндина


ДИПЛОМ

II Международной научно-практической конференции и специализированной выставки

«Экология в энергетике – 2005»

награждается

Центр подготовки и переподготовки специалистов в области экологии энергетики (ЦППЭЭ МЭИ)

за существенный вклад в повышение квалификации и профессиональную переподготовку в области экологии энергетики специалистов энергопредприятий и создание учебного пособия «Экология энергетики»


Благодарность

НАГРАЖДАЕТСЯ

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за надежные партнерские отношения, эффективную работу, взаимовыгодное сотрудничество и в связи с 50-летием дополнительного профессионального образования и с 5-летием Института дистанционного дополнительного образования

Директор ИДДО Т.А. Шиндина

ФГБОУ «НИУ «МЭИ»


ПОЧЕТНАЯ ГРАМОТА

НАГРАЖДАЕТСЯ

Путилова Ирина Вячеславовна

ГРАН-ПРИ

в номинации «Лучшая трудовая династия»

за сохранение преемственности поколений и формирование семейных трудовых традиций и в связи с 50-летием дополнительного профессионального образования и с 5-летием Института дистанционного дополнительного образования

Директор ИДДО НИУ «МЭИ» Т.А. Шиндина

Some results of the Center activity

- Ecology in power engineering: Manual / Edited by V.Y. Putilov. MPEI Publishers, - M., 2003, 715 p.
- State-of-the-art nature protection technologies in electric power engineering: Information collection / Edited by V.Y. Putlov. M.: MPEI Publishers, 2007 – 388 p.
- Information system "The Best Available and Perspective Nature Protection Technologies in the Russian Power Industry" (http://osi.ecopower.ru)
- More than 20 teaching aids on ecology in power engineering and environmental technologies at thermal power plants for MPEI students and trainees, studying at the Center, etc.

Data Base "The Best Available and Perspective Nature Protection Technologies in the Russian Power Industry"

- ✓Registered in 2013 as a Data Base
- ✓Copyright holder - MPEI
- ✓Authors: Putilov V.Y. and Putilova I.V.
- ✓Web: http://osi.ecopower.ru

Information system "The Best Available and Perspective Nature Protection Technologies in the Russian Power Industry"

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About the information system

The Information system "The Best Available and Perspective Nature Protection Technologies in the Russian Power Industry" (hereafter the System) contains the materials covering all the main aspects of the nature protection activity in power engineering.

The main objective of the System is information support of the nature protection activity in power sector for the following:

- implementation of ecologically and economically effective nature protection policy;
- training, improvement of professional skill and professional retraining of experts from power companies in high schools and other educational institutions according to the state-of-the-art requirements in the field of protection of environment from the man-made impact of the power objects.

Sources of information are as follows:

- results of the system researches on various aspects of ecological problems in power engineering, represented by the authors to the Editorial Board of the system;
- proceedings of international and Russian workshops and conferences on ecology in power engineering,
- expert analytic materials on different directions of the nature protection activity.

International conferences and workshops

- I International Scientific and Practical conference “Ecology in power engineering – 2000”.
- II International Scientific and Practical conference and specialized exhibition “Ecology in power engineering – 2005”.
- I-V International conference and workshops “Ashes and slags from TPPs – removal, transport, processing, storage”, Moscow, 2007, 2009, 2010, 2012, 2014.
- I International Practical Coal Ash Workshop in Poland, 2010, Warsaw - Silesia
- II International Practical Coal Ash Workshop in Poland, 2013

VI International Conference
“ Coal ash Russia-2022”

- Date: October 19-21, 2022
- Venue: Moscow
- Organizer: Centre for Science and Education “Ecology in Power Engineering”, Moscow Power Engineering Institute

Conclusion

Moscow Power Engineering Institute has many years of experience and a vast potential for solving environmental problems in power engineering and studying the consequences of climate change.

Our common goal is environmental preservation and limitation of the man-made impact from industrial enterprises and production.

A system approach in this field make it possible to solve environmental problems and train qualified green-minded personnel who take environmentally responsible decisions.

Thank you for your attention!

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