MINISTRY OF EDUCATION AND SCIENCE OF RF

MOSCOW POWER ENGINEERING INSTITUTE (TECHNICAL UNIVERSITY)

FACULTY OF PROFESSIONAL SKILL IMPROVEMENT OF TEACHERS AND EMPLOYEES

"APPROVED"
by MPEI Pro-rector of Additional Education,
Dr. Sci. Professor

_____ Maslov S.I.
"___" _____ 2011

STUDY PROGRAM

of improvement of professional skills of English-speaking translators under the program

"Structure and operation of state-of-the-art thermal power plant"

Short description of Study Program

Training area:	"Heat-and-power engineering" "Electric power engineering"
Basic specialties: №140101 №140204 №031202	Thermal power plants, Electric power plants, Translation and translation studies
Specialization:	no
Number of academic hours under curriculum, in total	285, including: class hours – 151; unsupervised work – 134
Form and place of training	• full-time tuition, work being discontinued; MPEI • full-time tuition, without discontinuing work under agreed schedule; MPEI or at Customer's site in case of corporate group
Target audience:	English-speaking translators and experts, involved in the project design and implementation together with foreign partners: • general management of power generation companies (Management companies), having no power engineering background; • construction and erection organizations; • design, commissioning and other special enterprises; • power generation and electric network companies.
A number of listeners in the group, persons	Up to 25
Qualification of the course leavers (listeners)	Professional skill improvement
Type of the issued document	State Certificate of Professional Skill

	Improvement
Requirements for education of the listener	Higher education
Requirements for work experience of the listener	• technical translators should possess work experience in power engineering companies for more than three years; • employees of technical, economic, law and other departments of power companies, having no special power engineering education, should pass the initial training and be skilled in spoken English language, and have the work experience in power companies of more than three years; • employees of technical, economic, law and other departments of power companies, having special power engineering education, should pass the initial training and be skilled in spoken English language

1. OBJECTIVES AND GOALS OF THE PROGRAM

The objective of the teaching the listeners under the program "Structure and operation of state-of-the-art thermal power plant" is their professional development in oral and writing types of translation from Russian into English and vice versa to create the possibilities for the Russian experts to discuss in English the issues relating to thermal power plant construction, structure and exploitation with foreign partners, namely:

- Heat part of power plants;
- Electric part of power plants;
- TPP operation in market conditions.

After leaving the training under professional skill improvement program "Structure and operation of state-of-the-art thermal power plant" listeners must be able and ready to do the following in Russian and English in oral and written forms:

- help as translators and take part as experts during the business negotiations with foreign partners;
- adequately accept, analyze and summarize information;
- analyze different types of discussions, speak in public, hold grounded discussion and polemic;
- analyze scientific and technical information and study domestic and foreign experience in the program subject area in Russian and English;
- justify proposals and making of certain technical decisions when solving of some practical questions, appearing at the design stage, construction, arrangement, maintenance and operation of thermal power plants and power networks;
- apply gained knowledge during the professional activity.

The program goal is improvement of professional skills of listeners (translators and experts) in the field of technical English relating to the following basic questions:

- Construction, structure and features of basic and auxiliary heat-mechanic equipment of thermal power plants;
- Construction, structure and features of basic power electric equipment and switch devices of thermal power plants;
- Air power and cable power lines of thermal power plants;
- TPP operational modes in the power system;
- TPP operation in market conditions;

- power engineering markets of Russia and other countries of the world;

2. DISCIPLINE LOCATION IN THE MAIN EDUCATIONAL PROGRAM OF HIGH PROFESSIONAL EDUCATION

Disciplines are based on general technical and natural-scientific subjects, studied within the basic part of professional cycle of general educational baccalaureate and magistracy program on directions “Heat power engineering” and “Electrical power engineering”. It’s based as well on subjects, taught during the preparation of experts in the field of technical translation from English into Russian under specialty “Translation and translation studies” in accordance with the Federal State Educational Standard of Higher Professional Education (FSES HPE). Knowledge, gained during the program mastering, are needed for listeners of professional skill improvement courses for their professional activity.

3. PROGRAM MASTEING RESULTS

As a result of professional skill improvement, listeners should demonstrate the following results of the study program mastering:

Know general information and accepted terminology of Russian and English relating to the following aspects:

- Constructions, structure and features of basic and auxiliary heat-mechanic equipment of thermal power plants;
- Constructions, structure and features of basic power electrical equipment as well as switch devices of thermal power plants;
- Constructions, structure and features of basic power equipment as well as switch devices of thermal power plants;
- Constructions, structure and features of basic power equipment as well as switch devices of power engineering network objects;
- Air power and cable power lines of AC and DC of thermal power plants;
- Air power and cable power lines of thermal power plants;
- TPP operational modes in power system;
- TPP operation in market conditions.
- power engineering markets of Russia and other countries world-wide;

The listeners should be able to:

- attend as translators and experts in business negotiations with foreign partners;
- apply the gained knowledge during their professional activity;

- analyze scientific-technical information, study domestic and foreign experience relating to the research subject;
- summarize, analyze, accept information, define goals, choose the way for their achievement;
- apply juridical and standard documents in their professional activity;
- analyze different types of discussions, speak in public, hold grounded discussions and polemics.

Listeners should possess:

- terminology on power engineering systems and networks in Russian and English;
- skills of oral (parallel and consecutive) and written translation from Russian into English;
- ability to discuss engineering solutions with foreign partners at design stage, construction, adjustment, maintenance and exploitation of thermal power plants and power engineering networks;
- skills of system analysis of accepted engineering solutions implementation effects at design stage, construction, adjustment, maintenance and exploitation of thermal power plants and power engineering networks.

4. THE PROGRAM STRUCTURE

The study program consists of four blocks; each block is intended for consideration of a complex of topics, combined by general direction. There are tests for knowledge verification of listeners for every topic. Tests can be also used by students for self-control of mastering their studying material. Mastering of each block of topics (studying discipline) ends by passing the exam.

The first block "**Classification and general indices of TPPs"** covers the following topics:

- **Introduction studies. Basic conceptions of thermal engineering. Terms and definitions.**
  - Classification and general indices of TPPs
  - Classification and power efficiency of TPPs:
  - Thermal schemes and specific fuel consumption at TPP;
  - Combined Heat Power Plants - CHPPs.
- **Primary heat-mechanic equipment of TPP:**
  - Boiler plants of TPP;
  - Steam-turbine plants - STPs;
  - Gas-turbine and steam-gas plants:

- **Auxiliary heat-mechanic equipment of TPPs:**

  - Regenerative heaters;

  - Deaerators;

  - Feed, condensing, circulation and district-heating pumps;

  - Forced-draft mechanisms;

  - Gas-air sections, ESPs, chimneys;

  - Fuel-preparation equipment;

  - Water treatment plants of TPPs;

  - Ash and slag removal at TPPs;

  - Thermal engineering armature.

The second block **"Electric part of thermal power plants**" covers the following topices:

- **Introduction studies. Basic terms of electrical engineering. Terms and definitions**
- **General characteristic of electric part of TPP;**
- **Primary power equipment of TPPs:**

  - Generators of power plant;

  - Transformer equipment.

- **Commutation and protective apparatuses of high voltage;**
- **Air and cable power lines – APLs and CPLs;**
- **State-of-the-art techniques of diagnostics and repair arrangement of TPP power equipment.**

The third block **"TPP operation in market conditions**" covers the following topics:

- **Operation of TPP as a part of electric power system;**
- **Electric power markets.**

The fourth block **"Translation from Russian into English and from English into Russian in the field of TPPs"** includes the studies for translation from Russian into English and vice versa of documentation as well as the studies of oral practice in the field of thermal power plants, namely:

- Written translation of technical, scientific-technical, business and other documentation;
- Oral consequent and parallel translation.

Concluding session. Testing of listeners and issuing the Certificates of professional skill improvement.

Before issuing the Certificates of professional skill improvement, listeners are tested. The test is shown in the Study program.

5. FEATURES OF STUDY PROCESS ARRANGEMENT

Before beginning of studies, according to the Study program lecturers of CPPEE MPEI develop electronic versions of education materials and presentations for each topic. Education materials after their examination and approval by management of CPPEE MPEI, are edited and published.

Education materials and schedule with the contacts of lecturers are emailed to every listener or Customer, in case of the corporate group, more than in two weeks prior to beginning of studies. Once the studies begin, printed education materials and electronic presentations are distributed to listeners. Thus, at in process of training of listeners, full-time tuition forms and distant educational forms are used.

In educational auditorium multimedia complex is set. It is actively used by lecturers during full-time tuition for their presentations, video demonstration, and also for presentation of other materials from Internet and electronic resources. In the educational auditorium there is a blackboard as well with colour felt-pens for graphic illustration of answers to questions, asked by listeners, which are not mentioned in education materials and presentations. In case of training at the Customer's site, requirements for equipment of the educational auditorium are the same.

Such educational process arrangement is targeted at creation of objectively comfort conditions to achieve maximum efficient result from education at the limited time.

CURRICULUM

of improvement of professional skills of English-speaking translators under the program

"Structure and operation of state-of-the-art thermal power plant"

Training direction: "Thermal power engineering" and " Electric power engineering"

Basic specialties: №140101 — Thermal power plants,

№140204 — Electric power plants,

№031202 — Translation and translation studies.

Specialization: -.

Number of academic hours by curriculum, in total – 285,

including:

- class hours – 151
- unsupervised work, hours – 134

Forms and place of training:

- full-time, work being discontinued; in MPEI
- full-time, general duration of in-service training according to the agreed schedule in case of forming a corporate group, in MPEI or on-site

№	NAME OF DISCIPLINES (STUDIES TOPICS)	Work volume of the listener, (academic hours)							Form of testing
		Under Curriculum, in total	with teachers					Unsupervised work	
			Total	Lectures	Tutorials and lab studies	Tutorial and individual studies	Defense, final test, exam		
1.	**Thermal part of thermal power plants**	**94**	**64**	**62**	**-**	**1,5**	**0,5**	**30**	**Exam**
	Introduction studies	2	2	2	-	-	-	-	
1.1.	*Classification and general indices of TPPs*	15	10	10	-	-	-	5	
1.1.1.	Classification and power efficiency of TPPs	6	4	4	-	-	-	2	
1.1.2	Thermal schemes and specific fuel consumption at TPP	6	4	4	-	-	-	2	
1.1.3	Combined Heat Power Plants - CHPPs	3	2	2	-	-	-	1	
1.2.	*Primary heat-mechanic equipment of TPP*	39	26	26	-	-	-	13	-
1.2.1.	Boiler plants of TPP	9	6	6	-	-	-	3	
1.2.2.	Steam-turbine plants – STPs	12	8	8	-	-	-	4	
1.2.3	Gas-turbine and steam-gas plants	18	12	12	-	-	-	6	
1.3.	*Auxiliary heat-mechanic equipment of TPPs*	36	24	24	-	-	-	12	-
1.3.1.	Regenerative heaters	2	1	1	-	-	-	1	

1.3.2.	Deaerators	2	1	1	-	-	-	1	
1.3.3.	Feed, condensing, circulation and district-heating pumps	5	4	4	-	-	-	1	
1.3.4.	Forced-draft mechanisms	3	2	2	-	-	-	1	
1.3.5.	Gas-air sections, ESPs, chimneys	6	4	4	-	-	-	2	
1.3.6.	Fuel-preparation equipment	3	2	2	-	-	-	1	
1.3.7.	Water treatment plants of TPPs	6	4	4	-	-	-	2	
1.3.8.	Ash and slag removal at TPPs	6	4	4	-	-	-	2	
1.3.9	Thermal engineering armature	3	2	2	-	-	-	1	
	Tutorials	1,5	1,5		-	1,5	-	-	
	Exam	0,5	0,5		-	-	0,5	-	**Exam**
2.	**Electric part of thermal power plants**	**42**	**26**	**24**	**-**	**1,5**	**0,5**	**16**	**Exam**
	Introduction studies	2	2	2	-	-	-	-	-
2.1.	*General characteristic of electric part of TPP*	4	4	2	-	-	-	2	-
2.2.	*Primary power equipment of TPPs*	14	8	8	-	-	-	6	-
2.2.1.	Generators of power plant	6	4	4	-	-	-	2	-
2.2.2.	Transformer equipment	8	4	4	-	-	-	4	-
2.3.	*Commutation and protective apparatuses of high voltage*	8	4	4	-	-	-	4	-
2.4.	*Air and cable power lines – APLs and CPLs*	6	4	4	-	-	-	2	
2.5.	*State-of-the-art techniques of diagnostics and repair arrangement of TPP power equipment*	6	4	4	-	-	-	2	-
	Tutorials	1,5	1,5	-	-	1,5	-	-	-
	Exam	0,5	0,5	-	-	-	0,5	-	
3.	**TPP operation in market conditions**	**17**	**9**	**8**	**-**	**0,5**	**0,5**	**8**	**Exam**
3.1.	*Operation of TPP a part of electric power system*	8	4	4	-	-	-	4	-
3.2.	*Electric power markets*	8	4	4	-	-	-	4	-
	Tutorials	0,5	0,5	-	-	0,5			
	Exam	0,5	0,5	-	-	-	0,5		
4	**Translation from Russian into English and from English into Russian in the field of TPPs**	**131**	**51**	**4**	**46**	**0,5**	**0,5**	**80**	**Exam**
	Tutorials	0,5	0,5	-	-	0,5			

	Exam	0,5	0,5	-	-	-	0,5		
	Concluding session (testing of listeners and issuing the Certificates of professional skills improvement)	**1**	**1**	**-**	**-**	**-**	**1**	**-**	**-**
	Total:	**285**	**151**	**98**	**46**	**4,0**	**3,0**	**134**	

STUDY PROGRAM

of improvement of professional skills of English-speaking translators under the program "Structure and operation of state-of-the-art thermal power plant"

Training direction: "Thermal power engineering" and " Electric power engineering"

Basic specialties: №140101 — Thermal power plants,

№140204 —Electric power plants,

№031202 — Translation and translation studies.

General duration of in-service training according to the agreed schedule.

Curriculum

Number of academic hours under curriculum, in total – 285

including:

lectures – 144

practical training and lab studies – 0

unsupervised work – 134

tutorials – 3

exams – 3

concluding session – 1

Final tests and exams, in total – 4

including:

exams – 4

final tests – 1

CONTENT OF STUDIES

1. Thermal part of thermal power plants

In total – 94 academic hours, lectures - 62 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 30 academic hours, tutorials – 1,5 academic hours, exam – 0,5 academic hours

Introduction studies

(in total – 2 academic hours, lectures – 2 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 0 academic hours)

Basic conceptions of thermal engineering. Terms and definitions.

Test questions:

1. Give a definition to the term "Equilibrium thermodynamic body" and what is the physical sense of it?
2. Give a definition to the first law of thermodynamics and explain its physical sense.
3. What is the second law of thermodynamics about and what is it physical sense?

4. Tell about thermodynamic properties of water and water steam relating to power engineering.
5. What is thermal efficiency of Carnot cycle and why the efficiency cannot exceed 100%?

1.1. Classification and general indices of TPPs

(in total – 15 academic hours, lectures – 10 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 5 academic hours)

1.1.1. Classification and power efficiency of TPPs

(in total – 6 academic hours, lectures – 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 2 academic hours)

Structure of TPP of the unified power system of Russia. Structure of fuel consumption at TPPs of Russia. Composition of power equipment of the power unit and a principle technological scheme of the power unit at condensation power plant. Arrangement of equipment in the Main building at TPP (power unit and cross-link configurations). General plan of TPP.

Basic technological parameters of energy conversion process at TPP and technological cycles. Influence of parameters of fresh steam and vacuum in condenser, and also feed water temperature on TPP efficiency. Indicators of gross and net power efficiency of TPP.

Test questions:

1. Characterize the TPP structure in unified energy system of Russia.
2. Tell about the structure of fuel consumption in unified energy system of Russia and about its trends.
3. What is the main difference between technological schemes of unit TPPs and TPPs with cross-link configuration?
4. Enumerate the basic and auxiliary thermal power equipment of TPPs and tell about its purpose.
5. Tell, what is the difference between gross and net power efficiency indicators of TPP?

1.1.2. Thermal schemes and specific fuel consumption at TPP(in total – 6 academic hours, lectures – 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 2 academic hours)

Thermal scheme of power unit of 300 MW. Thermal scheme of power unit of 500 MW of Reftinskaya SDPP. Power characteristics of the power unit. Start-up scheme of the power unit.

Development of innovative coal-fired power unit and its parameters. Plans for replacement of power units in operation, worked out their resource.

Example of heat engineering calculation of the principle thermal scheme of the power unit estimating the generated power capacity and specific consumption of the reference fuel.

Test questions:

1. What is “thermal scheme of power unit” and what it is used for?
2. Enumerate basic power characteristics of the power unit.
3. What are the pre-conditions of plans of Russian power sector modernization and what are the main features of modern domestic and foreign power units?
4. What does affect specific consumption of equivalent fuel and what are the ways of its reduction?
5. Tell about the influence of power unit operation modes on specific consumption of equivalent fuel.

1.1.3. Combined Heat Power Plants - CHPPs

(in total – 3 academic hours, lectures – 2 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 1 academic hours)

Principle thermal scheme of the power unit of CHPP. Efficiency of power and heat generation in the combined technological cycle. Parameters of power efficiency of CHPP. Thermal scheme of turbo-installation T-110-130. Scheme of heat-extraction equipment of CHPP. District heaters.

Test questions:

1. What is the core difference of principle thermal scheme of Combined Heat Power Plants and Condensation Power Plants?
2. Tell about parameters of CHPP power efficiency.
3. Are there any technological restrictions for operational modes of CHPP power units? If yes, tell what are they conditioned by?
4. What are network heaters used for?
5. Characterize the advantages and disadvantages of unit schemes and schemes with cross-link configuration for CHPPs at the appearance or absence of peak hot-water heaters.

1.2. Primary heat-mechanic equipment of TPP

(in total – 39 academic hours, lectures – 26 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 13 academic hours)

1.2.1. Boiler plants of TPP(in total – 9 academic hours, lectures – 6 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 3 academic hours)

Types, configurations and basic characteristics of boiler plants. Basic units and elements of boiler plants and their destination. Boiler plants for cross-link TPPs. Boiler plants for gas- and coal-fired power units of 300, 500 and 800 MW. Boiler-utilizers for steam-gas plants.

Test questions:

1. Tell about types and configurations of power boiler plants.
2. Name basic characteristics of power boiler plants.

3. Enumerate basic units and elements of boiler plants and tell about their destinations.
4. Give definition to boiler plants of gas- and coal-fired power units of 300, 500 and 800 MW. Tell about basic disadvantages of boiler plants, burning the main ranks of energy coal.
5. What are boiler-utilizers at SGI installation at TPP used for? Point out their peculiarities.

1.2.2. Steam-turbine plants - STPs

(in total – 12 academic hours, lectures – 8 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 4 academic hours)

Arrangement and operational principle of steam-turbine plants. Construction of the main units and details of steam turbines. Types of STPs and a field of their application. Equipment and characteristics of STPs.

State-of-the-art technical requirements for steam turbines. Retrofitting of STPs in conditions of TPPs being under operation.

Test questions:

1. Tell about the arrangement and operational principle of steam-turbine plants.
2. List STP types and tell about their field of application.
3. Tell about basic units of steam turbines.
4. Enumerate technical requirements for modern steam turbines.
5. What measures are applied to modernize STPs under operation?

1.2.3. Gas-turbine and steam-gas plants

(in total – 18 academic hours, lectures – 12 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 6 academic hours)

1.2.3.1. Gas-turbine plants

(in total – 6 academic hours, lectures – 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 2 academic hours)

Arrangement of the power gas-turbine plant (GTP). Advantages, disadvantages and field of GTP application in comparison with steam-turbine plants. Comparative characteristics domestic and foreign GTPs.

Test questions:

1. Tell about the purpose of GTPs, installed at Russian TPPs.
2. Tell about advantages and disadvantages of GTPs, applied at Russian TPPs.
3. Enumerate the key characteristics of Russian and foreign GTPs.
4. Tell about the appliance of GTPs for autonomous power supply systems.
5. What do you know about the prospects of more wide application of GTPs for TPPs, included in Unified Energy System of Russia, as well as about autonomous power supply system?

1.2.3.2. Steam-gas plants

(in total – 12 academic hours, lectures – 8 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 4 academic hours)

Idea of steam-gas technologies in power industry. Trends of development and a role of SGPs in foreign and domestic power engineering. Classification of SGPs, their types, advantages and disadvantages. SGPs with discharging gas in boiler. SGP of CHPP. Equipment of SGP of the utilized type (4 academic hours).

Introduction of SGP technologies at operating TPPs. Additional primary and auxiliary equipment and its characteristics. Technological compatibility of the newly installed and operating equipment. Assessment of technical, economic and ecological indicators of the state-of-the-art TPPs with steam-gas and gas-turbine superstructures (4 academic hours).

Test questions:

1. Give definition to the term “Steam-gas power technologies”.
2. Tell about the reasons for steam-gas power technologies appearance.
3. Classify the SGPs and tell about their types and structures.
4. What do you know about advantages and disadvantages of SGPs appliance at traditional TPPs under operation?
5. Estimate ecological and economic indicators of TPPs with SGP and GTP superstructures.

1.3. Auxiliary heat-mechanic equipment of TPPs

(in total – 36 academic hours, lectures – 24 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 12 academic hours)

1.3.1. Regenerative heaters

(in total – 2 academic hours, lectures – 1 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 1 academic hours)

Regenerative heaters. Purpose, operative principle, switching-on schemes and constructions of regenerative heaters

Test questions:

1. What is the purpose of regenerative heaters?
2. Tell about the principle of operation of regenerative heaters and their constructions.
3. How efficiency of power units with regenerative heaters is changing?
4. Show flow diagrams of regenerative heaters.

1.3.2. Deaerators

(in total – 2 academic hours, lectures – 1 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 1 academic hours)

Deaerators. Purpose, operative principle, switching-on schemes and configurations of deaerators.

Test questions:

1. What is the purpose of deaerators?
2. Tell about the processes occurring inside the deaerators.
3. Enumerate basic types of deaerators and their configurations.
4. Describe basic advantages and disadvantages of different types of deaerators.

1.3.3. Feed, condensing, circulation and district-heating pumps(in total – 5 academic hours, lectures – 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 1 academic hours)

Feed, condensate, circulating and district-heating pumps. Purpose, types, configurations and characteristics of pumps.

Test questions:

1. Tell about the purpose, types, configurations and characteristics of feed pumps.
2. Tell about the purpose, types, configurations and characteristics of condensate pumps.
3. Tell about the purpose, types, configurations and characteristics of circulating pumps.
4. Tell about the purpose, types, configurations and characteristics of district-heating pumps.
5. Tell about measures to prolong operational life and regulate productivity and consumption of capacity when changing the loading of power units or heat network.

1.3.4. Forced-draft mechanisms(in total – 3 academic hours, lectures – 2 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 1 academic hours)

Forced-draft mechanisms. Fans and smoke exhausters. Purpose, types, configurations and characteristics of FDMs.

Test questions:

1. Tell about the purpose, types and configurations of fans and smoke exhausters.
2. Tell about dependence of fan and smoke exhauster characteristics on types of working wheels.
3. Tell about dependence of fan and smoke exhauster operational characteristics on aerodynamics of in and out air ducts and flue ducts.
4. Tell about changing operational characteristics of smoke exhausters of coal-fired power units depending on operational efficiency of dust-collecting plants and abrasivity of fly ash.
5. Tell about the measures for regulating productivity and capacity consumption of fans and smoke exhausters at changing boiler plant load.

1.3.5. Gas-air sections, ESPs, chimneys(in total – 6 academic hours, lectures – 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 2 academic hours)

Gas-air sections, ESPs, chimneys. Purpose, structures, characteristics.

Test questions:

1. Give definition to the term “gas-air ducts” relating to TPP.
2. Which characteristics are used to define a quality of performance of gas-air ducts, considering their destination?
3. Tell about destination, types and constructions of electrostatic precipitators.
4. On what does the operational efficiency of electrostatic precipitator depend?
5. Tell about destination, types and constructions of chimneys.

1.3.6. Fuel-preparation equipment(in total – 3 academic hours, lectures – 2 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 1 academic hours)

Fuel-preparation equipment.

Test questions:

1. Tell about fuel-preparation equipment of gas-fired thermal power plants
2. Tell about fuel-preparation equipment at oil combustion.
3. Tell about the influence of oil preparation quality for combustion on safe boiler plant operation.
4. Tell about fuel-preparation equipment at coal combustion.
5. What types of mills are applied for coal dust preparation?

1.3.7. Water treatment plants of TPPs

(in total – 6 academic hours, lectures – 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 2 academic hours)

Water treatment plants of TPPs.

Test questions:

1. What is the purpose of water treatment plant of TPPs?
2. What are fresh water pre-treatment units applied for?
3. Tell about the methodology of make-up water treatment after mechanical admixture removal.
4. Tell about ecological characteristics of traditional and reagentless methods of make-up water treatment.

1.3.8. Ash and slag removal at TPPs

(in total – 6 academic hours, lectures – 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 2 academic hours)

Ash and slag removal at TPPs. Technologies and equipment of ash and slag removal systems. Economic and ecological indices of ash and slag removal systems at TPPs

Test questions:

1. Tell about the purpose of TPP ash and slag removal systems.
2. What types of TPP ash and slag removal systems do you know?
3. Enumerate the structure of different types of ash and slag removal system at TPPs.
4. Characterize ecological and economic indicators of traditional ash and slag removal system at domestic TPPs.
5. What requirements should meet ash and slag removal systems of TPPs with acceptable ecological and economic indicators?

1.3.9. Thermal engineering armature

(in total – 3 academic hours, lectures – 2 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 1 academic hours)

Thermal engineering armature.

Test questions:

1. Tell about the purpose of thermal engineering armature.
2. What do you know about types of thermal engineering armature?
3. What technical requirements should thermal engineering armature meet?
4. What standards are needed to regulate selection, assembly and exploitation of thermal engineering armature?
5. Tell about measures to prolong operational life of thermal engineering armature.

***Tutorials* - 0,5 academic hours.**

***Exam* - 0,5 academic hours.**

2. Electric part of thermal power plants

In total – 42 academic hours, lectures - 24 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 16 academic hours, tutorials – 1,5 academic hours, exam – 0,5 academic hours

Introduction studies

(in total – 2 academic hours, lectures – 2 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 0 academic hours)

Basic terms of electrical engineering. Terms and definitions.

Test questions:

1. The term and definition of current, voltage and resistance of active current collectors.
2. What parameters characterize capacitive and inductive current collectors?
3. Give definition to the Kirchhoff law and tell about its physical sense.
4. Give examples of capacitive and inductive loading.
5. What is the nature of electrical and magnetic fields and what is their danger in case they affect the human body?

2.1. General characteristic of electric part of TPP(in total – 4 academic hours, lectures – 2 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 2 academic hours)

Electrical circuits of power plants. Composition and destination of primary and auxiliary power equipment. Distributive devices. Circuits, applied at generative, high and middle voltage. Power supply of power plants auxiliaries. Destination, arrangement and equipment of relay protection and automatics systems. Relay protection (general and reserve) of power plant generators. Destination, arrangement and types of automatic regulators of generator induction.

Test questions:

1. Tell about electric circuits of power plants and their purposes.
2. Enumerate composition and purpose of basic and auxiliary power equipment of TPP.
3. What are distributive devices used for? What types of them are applied at TPPs?
4. What is relay protection at TPPs for and what does it protect?
5. What functions are fulfilled by automatic regulators of generator induction?

2.2. Primary power equipment of TPPs

(in total – 14 academic hours, lectures – 8 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 6 academic hours)

2.2.1. Generators of power plant

(in total – 6 academic hours, lectures – 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 2 academic hours)

Operational principle of the synchronized generators. Constructions and characteristics of the synchronized generators. Cooling system of generators. Systems of generator induction. Isolation improvement in windings of the synchronized generators.

Test questions:

1. Tell about the operational principle of synchronized generators.
2. What constructions and characteristics of synchronized generators do you know?
3. What cooling systems of generators are applied at domestic TPPs and what are advantages and disadvantages of them?
4. For what are systems of generator induction used and what types of them do you know?
5. What is the purpose of winding isolation of synchronized generators and which ways of its improvement do you know?

2.2.2. Transformer equipment(in total – 8 academic hours, lectures – 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 4 academic hours)

Operational principle and transformer arrangement. Types and characteristics of transformers. Autotransformers. Transformer configuration, isolation of windings. Transformers of TPP auxiliaries. Bypassing reactors, their destination, characteristics and operative modes.

Test questions:

1. Tell about the transformer operational principle and transformer arrangement.
2. What types and characteristics of transformers do you know?
3. What is the transformer winding isolation used for?
4. What are autotransformers and is their an essential difference between them and transformers?
5. What are house transformers and reactors used for?

2.3. Commutation and protective apparatuses of high voltage(in total – 8 academic hours, lectures – 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 4 academic hours)

Destination and classification of switch devices, conditions of their operation, requirements. Switches of high voltage. Isolators, separator, shorting plugs. Overvoltage limiters (OVL), valve-type arresters. Destination, characteristics and operative modes. Isolators.

Test questions:

1. Tell about the destination and classification of switch devices.
2. What requirements must switch devices meet?
3. What are isolators, separators and shorting plugs applied for?
4. Tell about the purpose and configurations of overvoltage limiters (OVL) and valve-type arresters.
5. What are isolators applied for and what materials are modern isolators made of?

2.4. Air and cable power lines – APLs and CPLs(in total – 6 academic hours, lectures – 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 2 academic hours)

Power delivery at TPP into electric power system. Types, marks and characteristics of APL wires. Field of application. APL pylons. Isolators and armature. APL operative conditions. General characteristic of CPLs. Isolation, used in cables. Oil-filled cables. Methods of cabling.

Test questions:

1. How is capacity supplied to electric power system?
2. What types, marks and characteristics of APL wires do you know?
3. What is the field of APL application?
4. What is the field of CPL application?
5. Tell about types of CPL and ways of their cabling.

2.5. State-of-the-art techniques of diagnostics and repair arrangement of TPP power equipment(in total – 6 academic hours, lectures – 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 2 academic hours)

Basic techniques of power equipment diagnostics. Defect detection at early stage of their occurrence. Assessment of functional operability of equipment. Volume and sequence of conducting complex diagnostics of power equipment.

Definition of a possibility to continue operation of power equipment without conducting repair works. Estimation of repair works volume in case of need. Prediction of residual life time and development of measures for prolongation of power equipment life time.

Analysis of configurations of power transformer manufactured in different periods of time. Characteristic disadvantages and defects of different transformer constructions. Influence of different transformer constructions features on their operation. Factors, impacting transformer life time reduction. Possible technical solution for modernization and reconstruction of transformers during capital repair, including introduction of monitoring systems.

Test questions:

1. What is power equipment diagnostics used for?
2. What principles are considered at creation of diagnostic system?
3. What is power equipment monitoring and what is the main difference between the monitoring and the diagnostics?
4. What is the relationship between the power equipment monitoring and repair arrangement?
5. How is the failsafe operational life of power equipment defined? What measures are needed to provide it?

***Tutorials* - 0,5 academic hours.**

***Exam* - 0,5 academic hours.**

3. TPP operation in market conditions

In total – 17 academic hours, lectures - 8 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 8 academic hours, tutorials – 0,5 academic hours, exam – 0,5 academic hours

3.1. Operation of TPP a part of electric power system(in total – 8 academic hours, lectures - 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 4 academic hours)

Unified electric power system of Russia. Use of power generated at power plants in the electric power system. Frequency regulation. Static and dynamic stability of operation of power plant generators. Normative parameters of stability and their ensuring.

Test questions:

1. Who organizes the operation of Unified energy system of Russia? What rights and obligations does the system operator have?
2. Give a definition to the term “locking power plant”? What type of power plants can function this way and why?
3. How is static and dynamic stability of power plant generator operation defined?
4. What is frequency regulation needed for? What are limits of its standard alternation?
5. What normative parameters of power system stable operation are used? How are they provided?

3.2. *Electric power markets*(in total – 8 academic hours, lectures - 4 academic hours, laboratory and practical training - 0 academic hours, unsupervised work – 4 academic hours)

Basic models of power systems control. Development of electric power market in England and Wales. Development of electric power markets in the U.S. Development of electric power market in power corporation NORDEL. Development of electric power market in EU. Ensuring of operational reliability of power systems and power corporations in the U.S. and Europe. Electricity market in the post-Soviet territory.

Test questions:

1. Tell about basic models of power system regulation in industrially developed countries of the world;
2. What is the power market of England and Wales? How was it changed for the last 30 years and why?
3. Tell about the US power market and point out the reasons of system failures for the last 30 years.
4. What are the national power systems of Germany, France and what is the structure of the EU power market?
5. Tell about the structure of power market of Russia and within the territory of post-soviet countries.

***Tutorials* - 0,5 academic hours.**

***Exam* - 0,5 academic hours.**

4. Translation from Russian into English and from English into Russian in the field of TPPs

In total – 131 academic hour, lectures - 4 academic hours, laboratory and practical training - 46 academic hours, unsupervised work – 80 academic hours, tutorials – 0,5 academic hours, exam – 0,5 academic hours)

Auditorium studies (in total – 50 academic hours, lectures - 4 academic hours, laboratory and practical training - 46 academic hours).

Checking the level of English by listeners, knowledge of terms and definitions in the field of thermal power plants, electric power systems and networks. Definition of skills in written and oral translation from English into Russian and from Russian into English in the field of electric power industry.

Studying and comparison of the established and used terms and the definitions applied in electric power industry in Russia and foreign English-speaking countries using "Terminological handbook on electric power engineering" (INVEL, Moscow, 2008, 700 P.).

Simultaneous interpretation of scientific and technical reports, presentations, negotiations. Analysis of typical errors at oral simultaneous and consecutive translation, and also at written translation of texts of regulations, maintenance instructions and other engineering specifications from English into Russian and from Russian into English.

Unsupervised work *(80 academic hours).*

Written translation of texts of regulations, maintenance instructions and other engineering specifications from English into Russian and from Russian into English.

Tutorials **- 0,5 academic hours.**

Exam **- 0,5 academic hours.**

Concluding session (1 academic hour). Questioning of listeners and issuing the Certificates of professional skill improvement.

Questionnaire to the concluding session

1. What is a modern TPP in your opinion?

   The modern TPP is

_____

_____

_____

_____

_____

2. Did you change your perception about TPP?

   yes no no answer

   If yes, then how?

_____

_____

_____

3. Do domestic TPPs correlate to the best foreign power plants?

yes **no** **no answer**

If no, then why?

4. Do you see new possible directions of domestic TPP modernizing?

yes **no** **no answer**

If yes, then which ones?

5. Do you consider this refresher training program useful?

yes **no** **no answer**

If no, then why?

6. Would you apply the gained knowledge in your further work?

yes **no** **no answer**

If no, then why?

7. Do you consider the knowledge, obtained during training under the program, enough for your work?

yes **no** **no answer**

If no, what issues are necessary to add into the revised program?

8. Are the certain questions considered enough in the program?

yes **no** **no answer**

If no, what questions should be considered in more details?

9. Do you consider in-class time enough for professional improvement under this program?

Yes **no** **no answer**

If **no**, then relating to which questions and how duration of studies should be changed?

10. Did the education materials and presentations help you in obtaining the knowledge under the training program?

yes **no** **not completely** **no answer**

If no, then why?

If not completely, then what should be changed in education materials?

11. Are education materials enough for successful training under the program?

yes **no** **no answer**

If no, then relating to which questions (aspects) are education materials not enough?

12. Do you consider the studying process well-arranged as a whole?

yes **no** **no answer**

If no, then what should be changed in arrangement of the educational process?

13. Do you consider the further development of this educational program useful?

yes **no** **no answer**

If yes, then what should be changed in the program?

14. Do you wish to pass training under professional retraining program?

yes **no** **no answer**

If yes, then which program would you prefer?

"Thermal power plants"

"Power plants"

1. Recommendations

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