



Новосибирский
государственный
технический университет
НЭТИ



REPORT

ON EXTERNAL REVIEW

of the cluster of educational programmes:

«Heat Power Engineering and Heat Engineering»
(13.03.01),

«Electric Power Industry and Electrical Engineering»
(13.03.02, 13.04.02)

delivered by Novosibirsk State Technical University



Novosibirsk, 2021

REPORT
ON EXTERNAL REVIEW

of the cluster of educational programmes

«Heat Power Engineering and Heat Engineering» (13.03.01),
«Electric Power Industry and Electrical Engineering»
(13.03.02, 13.04.02)

delivered by Novosibirsk State Technical University

Chair of the Review Panel



Victor Bolgov

Novosibirsk, 2021

CONTENTS

INTRODUCTION	4
1. CONTEXT AND MAIN STAGES OF THE REVIEW.....	4
1.1 Terms of Reference.....	4
1.2 Composition of the Review Panel	4
1.3 Purposes and objectives of the review	5
1.4 Stages of the review	5
2. DESCRIPTION OF THE EDUCATIONAL PROGRAMMES.....	10
3. FINDINGS	14
3.1 Standard 1. Policy (goals, development strategy) and quality assurance procedures of the study programmes	14
3.2 Standard 2. Design and approval of programmes	15
3.3 Standard 3. Student-centered learning, teaching and assessment ..	17
3.4 Standard 4. Student admission, support of academic achievements and graduation.....	19
3.5 Standard 5. Teaching staff.....	20
3.6 Standard 6. Learning resources and student support	23
3.7 Standard 7. Collection, analysis and use of information for managing the study programme	26
3.8 Standard 8. Public information	27
3.9 Standard 9. On-going monitoring and periodic review of programmes.....	28
3.10 Standard 10. Cyclical external quality assurance of study programmes	29
4. RECOMMENDATIONS FOR IMPROVEMENT	31
5. CONCLUSION	33
ANNEX A.....	34
ANNEX B.....	36
ANNEX B	39

INTRODUCTION

External review of the educational programmes «Heat Power Engineering and Heat Engineering» (13.03.01), «Electric Power Industry and Electrical Engineering» (13.03.02, 13.04.02) delivered by Novosibirsk State Technical University was conducted on April 27-29, 2021 and included the analysis of the self-evaluation report, online site visit to the University and preparation of the present report.

The main goal of the external review is to determine the correspondence of the reviewed educational programmes «Heat Power Engineering and Heat Engineering» (13.03.01), «Electric Power Industry and Electrical Engineering» (13.03.02, 13.04.02) delivered by Novosibirsk State Technical University to the standards and criteria of public accreditation developed by the National Centre for Public Accreditation (hereinafter – NCPA) in compliance with the European Standards of Quality Assurance in Education ESG-ENQA.

The Final Report is the basis for decision making of the National Accreditation Board on public accreditation of the educational programmes in compliance with the standards and criteria of NCPA.

1. CONTEXT AND MAIN STAGES OF THE REVIEW

1.1 Terms of Reference

According to item 1, 3 article 96 of the Federal Law of the Russian Federation of December 29, 2012 No.273-FZ “On education in the Russian Federation” organizations, which implement educational activities, may apply for public accreditation in various national, foreign and international institutions. Employers, employer associations and designated organizations have the right to conduct public accreditation of professional educational programmes, which are delivered by an educational institution.

In order to conduct international public accreditation of the educational programmes «Heat Power Engineering and Heat Engineering» (13.03.01), «Electric Power Industry and Electrical Engineering» (13.03.02, 13.04.02) NSTU applied to NCPA, which operates on the national level and is recognized by leading international organizations of quality assurance in higher education.

1.2 Composition of the Review Panel

The international expert was nominated by an international quality assurance agency on the request by NCPA. The Russian expert was nominated by the Guild of Experts in Higher Education.

The employer representative was nominated by JSC «Regional Electric Power Networks».

The representative of the students’ community was suggested by Siberian State University of Water Transport.

The composition of the External Review Panel was approved by NCPA.

The Review Panel included five international and national experts:

- **Viktor Bolgov** - Doctor of Engineering, senior researcher at the Estonian Maritime Academy, Professor at Virumaa College of Tallinn University of Technology, member of the IEEE Smart Grid Community, Aimed Power Ltd, member of the Board — foreign expert, Review Chair
- **Dmitrii Ivanov** - Candidate of Engineering, Associate Professor Department of General Physics and Nuclear Fusion, National Research University "Moscow Power Engineering Institute" — Russian expert, Deputy Review Chair
- **Götz Lipphardt** - Prof. Dr., Department of Electrical Engineering, Mannheim University of Applied Sciences — foreign expert, Panel member
- **Igor Antonov** - Head of the Centre for Networks Management «Regional Electric Power Networks» — representative of professional community, Panel member
- **Natalia Shnaider** - 3rd year student, Electrical and Mechanical Faculty, Siberian State University of Water Transport — representative of students, Panel member

The focused expert knowledge of the Panel members, long-term experience of working in the system of higher education and profession, active position of students and employers became the basis for effective consideration of issues within the framework of evaluation.

The participation of the Russian representatives of the higher education system gave an opportunity to analyze the activity of the programmes under evaluation in the context of the world trends in quality assurance and within the scope of the national educational system.

1.3 Purposes and objectives of the review

The purpose of public accreditation is improving quality of education and forming quality culture in educational institutions, discovering best practices in continuous enhancing the educational quality and public information on educational institutions in accordance with the European educational quality standards.

The main goal of the peer review is to determine the correspondence of the reviewed educational programmes «Heat Power Engineering and Heat Engineering» (13.03.01), «Electric Power Industry and Electrical Engineering» (13.03.02, 13.04.02) delivered by Novosibirsk State Technical University to the standards and criteria of public accreditation, which are developed by NCPA in compliance with the European Standards of Quality Assurance in Education ESG-ENQA; and to develop recommendations for the study programme with the purpose of improving the content and structure of the educational process.

1.4 Stages of the review

The review included three main stages:

1.4.1 Study of the self-evaluation report

Novosibirsk State Technical University was responsible for conducting the self-evaluation procedure, developing and timely submitting the self-evaluation report by the educational programmes «Heat Power Engineering and Heat

Engineering» (13.03.01), «Electric Power Industry and Electrical Engineering» (13.03.02, 13.04.02) to NCPA.

According to the "Guidelines on Self-evaluation of Educational Programmes", which were developed by NCPA, the self-evaluation report is written on 52 pages and includes: introduction, findings, conclusions, and annexes. The self-evaluation procedure was conducted on the basis of SWOT-analysis according to every standard of NCPA.

According to the review schedule, the self-evaluation report of the educational programmes «Heat Power Engineering and Heat Engineering» (13.03.01), «Electric Power Industry and Electrical Engineering» (13.03.02, 13.04.02) was submitted to NCPA and mailed to the members of the review panel 30 days before the site-visit.

While studying the self-evaluation report the Panel members formed a preliminary opinion about the reviewed educational programmes on compliance with the standards of NCPA and with the European standards of education quality.

The members of the Review Panel assessed the quality of preparation of the self-evaluation report with regards to its text structuring, compliance of information with the report's sections; quality of perception; sufficiency of analytical data; availability of references to supporting documents; completeness of information, which helped to make a preliminary expert opinion.

The Review Panel members pointed out some weaknesses of the self-evaluation report:

- it is difficult to find the information, documents and factual material contained in the report on the English-language version of the NSTU website;
- Annex 1 does not contain references to the University mission, goals and objectives;
- the report does not contain a list of disciplines, courses and modules, and there are no references to the regulations on admission to the educational programmes, on education and training and formative and final assessment of students;
- in some cases, the summary conclusions are not supported by statistics; the dynamics of the development of processes are poorly described, and some conclusions on weaknesses are not sufficiently discussed in the main part of the text;
- statistical data on international student activity are not provided.

According to the standards and criteria of accreditation of NCPA the preliminary assessment of the educational programmes «Heat Power Engineering and Heat Engineering» (13.03.01), «Electric Power Industry and Electrical Engineering» (13.03.02, 13.04.02) may be defined as "Substantial compliance".

The following lines of inquiry were developed:

- Incentives for the teachers;
- Participation of student representatives in developing the educational programmes;
- Getting feedback from students on the results of the semester/academic year and use of the information obtained in the evaluation of the professional activities of the teachers;

- Availability of officially approved procedures for the appeal of exam results.

The members of the external evaluation panel requested a number of additional documents before the visit to the University:

- statistics on the number of teachers with academic degrees;
- topics of graduate qualification papers agreed with representatives of employers;
- reviews of graduation papers.

During the preliminary meeting, the panel members developed the main strategy of the visit to the University.

1.4.2 Site visit

The Review Panel held a site visit to Novosibirsk State Technical University on April 27-29, 2021 with the purpose of confirming the accuracy of the information, which was presented in the self-evaluation report, collecting extra information on the implementation of the programmes under accreditation and checking their compliance with the standards and criteria of NCPA developed in accordance with the European standards of education quality assurance.

The time line and the agenda of the site-visit were determined by NCPA and approved by the administration of NSTU and the members of the Review Panel.

During the site-visit the Review Panel members conducted a number of meetings and interviews with:

- The University administration, people responsible for accreditation
- Dean of the Faculty and Deputies
- Heads of Departments
- Graduates
- Teachers
- Students
- Employers
- Concluding meeting of ERP with the HEI's representatives

The Chair of the Review Panel managed the Panel's work.

The Panel considers that the self-evaluation report, which was presented by NSTU, provided the experts with an opportunity to form an integral view on specific features of the delivery of the reviewed educational programmes «Heat Power Engineering and Heat Engineering» (13.03.01), «Electric Power Industry and Electrical Engineering» (13.03.02, 13.04.02).

The studied documents and the interviewed persons, the online visit to the Departments, University library and laboratories provided the Review Panel members with sufficient information about the reviewed educational programmes.

An important addition to the above mentioned meetings was the visit of the panel members to laboratories and classrooms:

Department of Power Stations:

- Laboratory of Industrial Electronics and Measurement;
- Laboratory of Relay protection, automation and diagnostics;-

- Laboratory of Automation of Power Systems;
- Computer classroom;

Department of Thermal Power Stations:

- Thermal Power Plant Laboratory;
- Laboratory of Low-Potential Energy

Department of Industrial Power Supply Systems:

- Laboratory of Power Supply Systems
- Electrification Laboratory;
- Laboratory of Non-Traditional and Renewable Energy Sources;
- Conference Hall;
- Computer classroom;

Department of Electromechanics:

- Engineering Center for Energy Efficient Electromechanics and Mechatronics;

In addition, the Review Panel visited the scientific and technical library of the University, the teaching departments of Thermal Power Plants, the specialized "Energoclassroom" for conducting educational and research classes with secondary school students.

The members of the Review Panel attended training sessions with students of educational programmes:

13.03.02 "Electric Power Industry and Electrical Engineering":

- laboratory class in the discipline " General Physics "(group EM- 03, teacher N. Berezin);

- laboratory class in the discipline "Electrical and electronic devices" (group EM-82, teacher E. Abrramov);

13.03.01 "Heat Power Engineering and Heat Engineering"

- lecture in the discipline "Technical Measurements and Devices" (groups TE-81, TE-82, teacher V. Gusev).

The Review Panel considers it necessary to highlight the effective cooperation of the experts with NCPA employees during the site-visit and its preparation.

The Review Panel notes the highest level of organizational provision and constructive work.

The executive staff of NSTU provided the administrative support, which included arrangement of meetings and interviews, provision with necessary research, academic and methodological documents.

The Review Panel members requested additional documents during the online site-visit to Novosibirsk State Technical University.

On the last day of the site-visit the Chair of the Review Panel presented an oral report on the general conclusions to the executive staff of the University.

The schedule of the site-visit can be found in Annex A.

1.4.3 Conclusion on the findings of the external review

Based on the results of the external review of Novosibirsk State Technical University the Review Panel submitted the Report on the results of the external review of the educational programmes «Heat Power Engineering and Heat Engineering» (13.03.01), «Electric Power Industry and Electrical Engineering» (13.03.02, 13.04.02) delivered by the educational institution.

The draft report of 35 pages excluding Annexes was developed by the Chair of the Review Panel, approved by the other Review panel members and submitted to the National Centre for Public Accreditation. Then the Report was mailed to the University's administration for making factual amendments.

2. DESCRIPTION OF THE EDUCATIONAL PROGRAMMES

Educational programmes «Heat Power Engineering and Heat Engineering» (13.03.01), «Electric Power Industry and Electrical Engineering» (13.03.02, 13.04.02) are delivered at the Faculties of Mechatronics and Automation and the Faculty of Power Engineering.

The activities of the faculties and graduate departments that implement the cluster of the educational programmes under accreditation are carried out in accordance with the university-wide mission, goals and objectives. The mission of each educational programme is clearly defined and consistent with the mission of the University, taking into account the trends of regional development in the field of research and development of fuel equipment, electromechanical power steering, as well as modernization and automation of technologies in metalworking, transport systems, food and light industry, improving the efficiency of modern electric power systems, developing methods for modeling situational management of power plants. Specific goals, directions and expected outcomes from their implementation are formulated in the documents "General characteristics of the main professional educational programme of higher education" in the areas of training: 13.03.01 "Heat Power Engineering and Heat Engineering", profile "Production of heat and electric energy", 13.03.02 "Electric Power Engineering and Electrical Engineering", profile "Electrical Engineering, Electromechanics and Electrical Engineering", 13.04.02 "Electric Power Engineering and Electrical Engineering", master's programmes "Power supply and Control systems», "Relay protection and automation of electric power systems", "Mechatronics and automated complexes and systems", "Improving the energy efficiency of electric transport systems". Information about the educational programmes is available on the website of the NSTU.

The goal of the educational programmes is to train a specialist who is able to carry out research, design, organizational and managerial, expert, supervisory and inspection and audit professional activities. The main educational programmes are focused on the implementation of the following principles:

- priority of practice-oriented knowledge of the specialist;
- focus on the development of the local regional community;
- formation of readiness to make decisions and act professionally in non-standard situations;
- formation of the need for continuous development and innovation in the professional sphere;
- independent implementation of research in the field of safety, planning of experiments, processing, analysis and generalization of their results, making forecasts;
- formation of competencies for optimizing production technologies in order to reduce the impact of negative factors on humans and the environment;
- ability to organize environmental protection activities at the level of the enterprise, territorial production complexes and regions, as well as the activities of enterprises and the region in emergency situations.

The educational programmes under accreditation are provided with well-developed material and technical resources for the implementation of all types of scientific and educational activities:

- the Interfaculty Research Laboratory of Quantum Cryogenic Electronics;

- the Laboratory Complex and Design Bureau of Electromechanics;
- the Metallographic Laboratory;
- the Thermal Laboratory;
- the Laboratory of Automated Electric Drive;
- the Electrotechnical Laboratory;
- the Laboratory of Hydraulic and Pneumatic Control Systems (NSTU and the Festo Company);
- the educational and research Laboratory of Energy and Resource Saving Technologies;
- the educational and research laboratory "Production Mechanisms Automation";
- the research and educational center "Energocenter";
- the Energy Efficient Mechatronics and Electromechanics Engineering Center;
- the Information and Analytical Center for Innovation-Driven Development of Energy;
- the Research Laboratory of Low-Potential Energy;
- the Center for Testing, Monitoring and Control Devices of Controlling Modes of Electric Power Systems;
- the Center for Energy Saving and Energy Audit;
- the NSTU Energy Center;
- NSTU EnergoClassroom;
- the interdepartmental research Laboratory for Processing, Analysis and Presentation of Data in Electric Power Systems;
- the Automation of Power Systems Laboratory;
- the educational Power Plant Laboratory;
- the laboratory "Testing Center for Control and Mode Control Devices";
- the digital multi-brand laboratory "Automation of Power Systems";
- the laboratory "Engineering Center for Energy Efficient Electromechanics and Mechatronics";
- the laboratory "Automation of Production Mechanisms".

NSTU has at its disposal its own scientific library, equipped with the most up-to-date resources.

The NSTU has its own distance education system DISPACE, to be used for educational purposes and independent work of students. It provides development, storage and content delivery.

The implementation of the educational programmes is carried out by the teaching staff who have basic education corresponding to the profile of the taught discipline (98.5% in the Master's Programme, 89% in the Bachelor Degree Programmes).

The percentage of the staff holding academic degrees and titles meets the requirements of the Federal State Educational Standard for Higher Education in Russia.

The share of the teaching staff from among the managers and employees of organizations whose activities are related to the profile of the programmes with the work experience in this professional field of no less than 3 years is 19.4 %.

96% of the teachers have work experience in scientific organizations or scientific departments of NSTU as managers or researchers and combine research and teaching activities.

More than 92% of the teachers participate in the implementation of research in the area of educational programmes. They are authors of educational and methodological manuals on the subjects of the curriculum, practical, technical and methodological guidelines, and regular participants in conferences and congresses at the national and international level.

The expected learning outcomes of the educational programmes are described in the form of competencies of graduates which meet the requirements of the Federal State Educational Standards of higher education (bachelor's and master's levels) in these areas and training profiles, professional standards, and labor market requirements.

Each year, the programmes are evaluated through internal monitoring. The compliance of the educational programmes with the requirements of the Federal State Educational Standards of Higher Education and the customers of educational programmes is checked. Based on the results of the independent assessments, a decision is made on the necessary adjustments. The NSTU supports a mechanism for involving employers in the analysis of the content of programmes through reviewing by employers both of the curriculum as a whole, and individual modules, disciplines, and practices.

Systematic work aimed at monitoring students' academic performance is carried out by the degree-granting departments and include:

- formative assessment weeks in every semester;
- student attendance control (done by lecturers);
- discussing student performance at departments' meetings;
- research supervisors' control of the fulfillment of a Master's student individual plan;
- the student performance ranking;
- discussing student performance during every semester at the Faculty Academic Council meetings.
- discussing the results of the implementation of educational programs and analysis of the effectiveness of the corrective actions at all levels.

The specific forms of current and intermediate assessment of students in each discipline are determined by the curriculum. The formative assessment in the disciplines is carried out on the basis of a point-rating system. The assessment regulations in the disciplines are defined in the working programmes of the disciplines and are brought to the attention of students during the first month of studying the discipline.

Graduates of educational institutions of Novosibirsk, the Novosibirsk region, Russia, the countries of the near and far abroad are admitted to the educational programmes. Unique laboratories equipped with modern equipment are used in the educational process.

The students of the Faculty of Mechatronics and Automation take an active part in research projects of the departments. Graduates are able to build a career in the leading national and international companies, and often set up an innovative business of their own.

The students of the Faculty of Power Engineering carry out research projects within the framework of the national technology initiative EnergyNET which is shaping the future of power engineering. The partnership relations of the Faculty of Power Engineering with the leading generating, grid, sale and engineering companies of the region guarantee the employment of students after graduation.

NSTU has the International Service Department which includes the International Education Centre to make social, cultural, educational and living of foreign students more comfortable.

There are also language, cultural and international centers such as: the Confucius Institute, the German Academic Exchange Service (DAAD), the Centre of the Russian Language and Culture in Xian (China), and the Russian Testing Centre for foreigners. Foreign students are guided and provided with help from the moment of their arrival in Novosibirsk till graduation.

The International Service supervises organizing and supporting network academic programmes and programmes of academic exchange such as (DAAD), Erasmus+, Tempus MRAM, the Shanghai cooperation organization.

To support academic mobility of students and to adapt the education received at NSTU if students want to get a job or to undertake an internship abroad, the Management of the Division of Licensing and Accreditation of Education Programmes issues the European Diploma Supplement. The graduates of the programmes under accreditation received 8 European Diploma Supplements in 2017, 8 European Diploma Supplements in 2018, 21 European Diploma Supplements in 2019, 7 European Diploma Supplements in and in 2020.

The graduates of the educational programmes under accreditation have the skills of design, production and technological activities at electric power and heat power facilities; students of these educational programmes are in demand by leading industrial enterprises.

3. FINDINGS

3.1 Standard 1. Policy (goals, development strategy) and quality assurance procedures of the study programmes

*Compliance with the standard: **full compliance***

Table 1 - Criteria to Standard 1

Nº	Subject of Evaluation	Mark
1.	Availability of a documented inner quality assurance system providing continuous enhancement of quality in accordance with the developmental strategy of the educational institution	A
2.	Participation of all stakeholders (administration, teaching staff, students, employers, employer associations, branch ministries and departments – key partners in employment of graduates) in developing and implementing a quality assurance policy through relevant structures and processes	B
3.	Participation of all structural units of an educational institution in quality assurance processes and procedures	A

Analysis of the compliance of the cluster of educational programmes with the standard:

The NSTU has developed and operated a quality policy, which is not only consistent with the strategic goals, but also aimed at meeting the needs of customers, staff and fulfilling the tasks of the development of the NSTU. The responsibility for updating the quality objectives and communicating them to the heads of structural divisions is assigned to the representative of the quality management. The goals in the field of quality of departments and information about their achievement are reflected in the plans of structural divisions (faculties, departments, and centers).

Specialists of the Research and Educational Center "Quality Management" are engaged in maintaining the QMS documentation in working order, organizing the system of internal audits, monitoring processes, maintaining the system of continuous training and retraining of NSTU employees on quality management issues, interacting with third-party organizations on conducting certification and supervisory audits of the QMS.

The meetings of the Review Panel members with the University management, deans of faculties, heads of departments, teachers, students and representatives of employers confirmed the participation of all departments of the educational organization and key partners in the processes and procedures of the internal quality assurance system.

Achievements:

1. NSTU has in place a developed up-to-date quality management system. It is issued as a separate document "Quality policy of the NSTU" and approved by the Rector. The policy of the NSTU is made public by posting on the

website and on information stands. All employees of NSTU are familiar with the Quality Policy, which is confirmed by the entries in the sheets of familiarization with the document, they understand their tasks and responsibility for the implementation of this Quality Policy. The Rector of NSTU informs the members of the Academic Council of the Quality Policy, goals, objectives and plans, making an annual report to the Academic Council. The responsibility for familiarizing employees with the Quality Policy is assigned to the head of the structural unit, to the quality officials.

2. All participants in educational relations take an active part in monitoring and improving the quality of educational programmes. For example, representatives of the following companies participate in reviewing and updating the educational programmes: Regional Electric Networks JSC, the KOTES-Engineering Company LLC, the Siberia-Mechatronica Company LLC, the Siberian Generating Company LLC, the Institute of Energy Systems Automation JSC, the NPP Microprocessor Technologies Company LLC, , the Bolid Company LLC, Company Irbis LLC, the Sinetic Company JSC , the FGUP Production Association Sever and others.

Recommendations:

1. It is recommended that the participation of employers in the annual procedures for updating educational programmes should be systematized.

2. It is recommended to specify the role of the departments (faculties, departments, laboratories) in the control process.

3. It is recommended that the feedback system from graduates should be improved; a system of annual events and procedures for the participation of graduates in the implementation of the quality assurance system should be developed.

3.2 Standard 2. Design and approval of programmes

Compliance with the standard: **full compliance**

Table 2 - Criteria to Standard 2

№	Subject of Evaluation	Mark
1.	Availability and accessibility of clearly defined, documented, approved and published goals and objectives of a study programme and expected learning outcomes and their correspondence to the mission and goals and objectives of the educational institution	A
2.	Availability of procedures for design, approval and revision of a study programme (including expected learning outcomes) with the account of the development of science and industry, and also with the consideration of stakeholder opinions (administration, teaching staff, students, employers)	B
3.	Consideration of the requirements of professional standards (if available), of labour market, of national qualification framework descriptors in the study programme	A

Analysis of the compliance of the cluster of educational programmes with the standard:

The Review Panel got acquainted with the curricula, syllabi of the disciplines, the pool of assessment tools and came to the conclusion that the goals of the main educational programmes of the cluster and the learning outcomes are formulated in accordance with the Mission of the NSTU and the requirements of employers of Novosibirsk region, as well as in accordance with the established requirements of the Federal State Educational Standard.

The mechanism for developing, updating and modifying academic programs in accordance with market demand is presented in the QMS 7.5.1-08-2018 "Procedure for the development and approval of educational programs of higher education - bachelor's programs, specialist' programs, master's programs, and postgraduate programs at Novosibirsk State Technical University". The educational programmes under accreditation meet the requirements of professional standards.

The information about the educational programmes is available on the website of the NSTU, as well as at the relevant departments (in the form of the copies of approved documents).

The mechanism for the development, updating and adjustment of educational programmes, includes various ways of involving employers in the development of educational programmes:

- involvement of employers in conducting classes;
- agreeing the content and conditions of conducting research practice, and research work of students;
- conducting the state final attestation with the participation of employers;
- review by employers of both the curriculum on the whole and individual modules, disciplines, and practices.

However, despite the active work of the University to involve employers in reviewing educational programmes and relevant documents, the Review Panel considers it necessary to strengthen the participation of employers in this process, to make it systematic and regular.

Achievements

1. The mechanism of reviewing educational programmes at the University and department level with the involvement of representatives of key employers, such as JSC "Regional Electric Networks", LLC "KOTES-Engineering", LLC "Siberia-Mechatronics", LLC "Siberian Generating Company", JSC "Institute of Automation of Power Systems", LLC NPP "Microprocessor Technologies", LLC "Bolid", LLC NPF "Irbis", JSC "Synetic", FSUE PO "Sever", etc. has been effectively implemented.

2. The educational programmes are focused on the requirements of the regional market, industry, and professional standards.

Recommendations:

1. It is recommended to systematically involve employers in the procedures for the development, approval and review of the educational programmes.

2. It is recommended to organize monitoring to assess the market conditions and competitors in the educational market in order to effectively transform programmes and focus them on specific customers.

3.3 Standard 3. Student-centered learning, teaching and assessment

Compliance with the standard: **full compliance**

Table 3 - Criteria to Standard 3

Nº	Subject of Evaluation	Mark
1.	Consideration of needs of diverse groups of students and a possibility to create individual learning paths	A
2.	Use of methods encouraging students to take an active part in creating the learning process	A
3.	Use of clearly defined criteria and objective assessment procedures of learning outcomes/ competences of students corresponding to the expected learning outcomes, goals of the study programme and their purpose (diagnostic, formative or summative assessment)	A
4.	Information about the study programme, criteria and procedures for assessment of learning outcomes/competencies, about examinations, tests and other types of control.	A
5.	Use of procedures of independent assessment of learning outcomes	B
6.	Availability and effectiveness of appeals procedure and procedures for dealing with students complaints	A

Analysis of the compliance of the cluster of educational programmes with the standard:

The ERP noted that student-centered learning is implemented in accordance with the standard curriculum and the learning calendar schedule, and the individual learning paths of students.

The personality-oriented educational environment, which is in place at the University, allows students to show their intellectual abilities and creative potential in participating in competitions for increased scholarships, grants, conferences, scientific seminars, etc. Since 2016, NSTU has been the base platform for conducting the Federal Internet Exam for Bachelor graduates and undergraduates at any stage of training (FIEB). According to the results of the training, participants are issued certificates.

NSTU hosts Internet Olympiads in technical sciences.

Since 1997, the best students have been awarded the Prometheus Prize in the "Science" category.

The students of educational programme 13.03.02 "Electric Power and Electrical Engineering" actively participate in the Federal Exam in the field of Professional Education (FEPO) with high results.

The support for special needs students is provided by the Institute of Social Technologies (IST), as well as the teaching staff and educational support staff of the University, which is trained to work with this category of students. IST is located in a specially built educational building for the training of students of various disability groups and LOWZ, which is equipped with all the necessary resources for this.

Surveys are actively used as a method to encourage students to be actively involved in enhancing the educational process. The results of monitoring the degree of satisfaction with the educational programmes are discussed at the meetings of the Academic Council of faculties and departments. Follow up measures are taken based on this information.

The NSTU Student Council was established in order to ensure that the rights of students are respected in such areas as the management of NSTU, important issues of students' life, implementing social initiatives and others.

The meetings of the panel members with the students confirmed their great interest in learning outcomes, high motivation for learning and satisfaction with the education and training. The panel also got acquainted with the results of students' participation in various Olympiads, competitions and grants.

Achievements

The educational programmes are designed to meet the needs of different groups of students. The personality-oriented educational environment contributes to the development of students in different areas: educational, research, cultural, etc.

1. The accessible digital educational environment DiSpace is developed and effectively used.

2. The University has developed and implemented a student questionnaire – a documented procedure for obtaining information from students in order to assess the level of satisfaction with the educational program and learning conditions.

3. Students actively participate in building their individual educational paths.

Recommendations:

1. It is recommended to specify in detail the procedures for conducting exams and formative assessment in the description of each educational programme of the cluster under accreditation.

2. It is recommended to develop a mechanism for increasing the transparency of the evaluation system for formative and summative assessment.

3. It is recommended to diversify the elements of independent assessment of the quality of education.

3.4 Standard 4. Student admission, support of academic achievements and graduation

Compliance with the standard: **full compliance**

Table 4 - Criteria to Standard 4

Nº	Subject of Evaluation	Mark
1.	Systematic career guidance work targeted at the recruiting and selection of applicants should be in place	A
2.	Availability and effectiveness of rules and regulations for admission, transfer of students from other educational institutions, recognition of qualifications, periods of study and prior learning	A
3.	Systematic work to support students' progression	A
4.	Recognition of higher education qualifications obtained in the RF and abroad (Diploma Supplement)	A
5.	Participation of students in mobility programmes	B

Analysis of the compliance of the cluster of educational programmes with the standard:

NSTU has a well-established system of career guidance work with applicants and students which includes excursions for potential applicants (schoolchildren, undergraduate students); conferences, seminars, Open Days and visiting secondary schools by University teachers. Attracting prospective students is carried out through participation in competitions, conferences, grants from various foundations

The University carries out systematic work to support the academic performance of students, which is conducted by the graduate departments and deans' offices and includes:

- control weeks during each semester (weeks 7 and 12);
- monitoring student attendance (on a regular basis by teachers);
- consideration of issues of academic performance at the meetings of the department;
- supervisors' control over the implementation of the individual master's plans;
- student performance rating (at the end of each semester);
- discussion of the results of academic performance for the semester at meetings of the Academic Council of the faculties.

Information, collection and analysis of academic achievements is carried out by the Department of Students' Research work, the deans' office and graduate departments.

During the meetings with the members of the Panel, the students of educational programs and graduates shared how the career guidance work organized by the University influenced their choice of the study programme and what opportunities for academic mobility were available to them.

Achievements:

1. Systematic work on supporting students' academic performance is in place;
2. The University has developed a system of career guidance for the selection of applicants.

Recommendations:

1. It is recommended to establish regular work on promoting student mobility programmes.
2. It is recommended to organize meetings with students who have studied abroad.
3. It is recommended to introduce meetings with representatives of foreign universities, and, if possible, to organize study trips of students to foreign universities.

3.5 Standard 5. Teaching staff

Compliance with the standard: **full compliance**

Table 5 - Criteria to Standard 5

Nº	Subject of Evaluation	Mark
1.	Qualification and competence of the teaching staff : – Academic degrees and titles; – Industry and state awards and prizes; – Practical experience; – Published text books, handbooks and methodological guidebooks	A
2.	Relevance of specialists, degrees and titles and /or practical experience to the profile of the study programme	A
3.	Research activity of the teaching staff, implementation of research results in the academic process	A
4.	Use of innovative teaching methods and advanced technologies	A
5.	Visiting lecturers from other educational institutions including those from abroad	B
6.	Participation of the teachers in joint international projects, internships abroad, academic mobility programmes	B
7.	A system of financial and non-financial incentives for teachers	B
8.	Availability and use of clear, transparent and objective criteria for: – Hiring staff including teachers from foreign educational institutions, assignment to positions, promotion, dismissal; – Dismissal of teachers with low level of professional competency	A
9.	A system for career development and professional advancement for teachers	A

Analysis of the compliance of the cluster of educational programmes with the standard:

The educational programme is implemented by teachers who have a basic education corresponding to the profile of the taught discipline.

Members of the staff responsible for educational programmes:

- S.L. Elistratov, Doctor of Technical Sciences, Associate Professor, Head of the Department of Thermal Power Plants of the Faculty of Energy

- A.G. Rusina, Doctor of Technical Sciences, Associate Professor, Head of the Department of Electric Power Plants of the Faculty of Energy;

- D.A. Pavlyuchenko; Ph.D., Associate Professor, Head of the Department of Power Supply Systems of Enterprises of the Department of Energy

D.A. Kotin, Ph.D., Associate Professor, Head of the Department of Electric Drive and Automation of Industrial Installations, Faculty of Mechatronics and Automation

- N.I. Shchurov Doctor of Technical Sciences, Professor, head of Department, electrical systems, faculty of Mechatronics and Automation

All heads of educational programmes are actively engaged in research work, project management, R & D projects, conduct training of graduate students, have a high publication activity, for example:

Doctor of Technical Sciences, Associate Professor, Head of the Department of Thermal Power Plants, S.L. Elistratov participated in more than 20 international conferences; Hirsch index: RSCI-6, Scopus-7, WoS-6. He is a Government Prize winner in the field of science and technology;

Doctor of Technical Sciences, Associate Professor, Head of the Department of Electric Power Stations Rusina A.G. is a co-author of more than 80 highly rated publications, including foreign ones; she participated in more than 50 international conferences; Hirsch index: RSCI-7, Scopus-3, WoS-1;

Candidate of Technical Sciences, Associate Professor, Head of the Department of Power Supply Systems of Enterprises, D.A. Pavlyuchenko prepared more than 110 scientific papers based on the results of his research; Hirsch index: RSCI-7, Scopus-4, WoS-2; He co-authored 15 educational and methodological works, including 3 textbooks "Power supply systems»;

Candidate of Technical Sciences, Associate Professor, Head of the Department of Electric Drive and Automation of Industrial Installations D. A. Kotin is a co-author of more than 80 highly rated publications, including foreign ones, he participated in more than 30 international conferences; the Hirsch index: RSCI-6, Scopus-4, WoS-2; he registered 5 intellectual property objects.

The teaching staff is actively engaged in research work within the framework of various programmes initiated by the state and various non-governmental foundations and companies.

In order for students to achieve the planned learning outcomes, the teaching staff uses interactive teaching methods that encourage students to actively think and practice in the process of mastering the educational material. Such teaching methods as the method of brainstorming, seminars – discussions, business games, project activities are used.

In addition, during the procedures of formative and summative control group assessments and mutual assessments are used: students review each other's works; projects, and reports.

More than 16% of teachers from other educational and research organizations work as part-timers on a permanent basis (for example, E.A.-Sovban, chief specialist of the hydroelectric power department of the operational planning service of JSC "SO UES"; V.E Glazyrin.- chief specialist of the Technological Automation Department of JSC "IA ES"; D.V.Antononkov, Chief Power Engineer of JSC "Siberian Anthracite"; A.A.-Zhidkov, Chief Engineer of the Department of Energy Systems Development of LLC "INPES"; O.A. Kabov; Professor, Doctor of Physics, Head of the Laboratory of Intensification of Heat Transfer Processes at the S. S. Kutateladze Institute of Thermophysics; I. S. Anufriev, Doctor of Technical Sciences, Senior Researcher at the Laboratory of Radiation Heat Transfer at the S.S. Kutateladze Institute of Thermophysics, etc.)

The teachers participate in various forms of international activity (from educational projects to the organization of international conferences):

- The International Project of the European Community TEMPUS-TACIS CP-20021-98 "Dissemination of knowledge in the field of modern energy-saving electrical technologies" –

- The International Russian-Korean Symposium on Science and Technology;

- Tempus Project of THE European Community 511086-TEMPUS-1-2010-1-DE-TEMPUS-JPCR "PhD Education in Energy Efficient Electrotechnologies at Russian Universities".

Employees and postgraduates of the departments take part in international internships, for example, at the University of Hanover (Germany), the University of Padua (Italy). In 2018 and 2019, International Summer Schools "Control and Automation in Electrical Devices and Systems" were organized and held for students and postgraduates of NSTU, lectures were given by Professor D. S. Naidu from the University of Minnesota Duluth (USA) , as well as Professor C. Lupi and Associate Professor M. Forzan from the University of Padua (Italy)

The NSTU provides a system of financial incentives for the teaching staff, which is based on the developed regulatory documents. Since 2016, the University has implemented a system of effective contract of the teaching staff. NSTU annually hosts a competition for the development of educational and methodological publications, monographs, and electronic educational resources, which is a powerful incentive for the professional self-realization of the teaching staff.

Achievements:

1. Highly qualified teaching staff: 97.2 % have an academic degree or experience in the relevant professional field; 96% of teachers have experience working in research organizations or research departments of NSTU as managers or performers of research and development, and combine research and teaching activities;

2. High involvement of the teaching staff in conducting research: 92% of teachers participate in the implementation of research in the area of the taught disciplines. Many teachers are authors of educational and methodological manuals on the subjects of the curriculum, practical, technical and methodological works; they regularly participate in conferences and congresses at the national and international level;

3. Availability of the DiSpace digital educational environment accessible to teachers;

4. Active involvement of new young teachers in the work of the departments;

5. Availability of a system of human resource development. 100% of the teachers who implement bachelor's and master's programmes have completed advanced training in specialized organizations over the past 3 years.

Recommendations:

1. It is recommended to take into account the increased workload associated with additional work in the context of the pandemic and remunerate teachers for extra work.

2. It is recommended to provide teachers with the maximum possible technical support in designing and developing new electronic courses.

3.6 Standard 6. Learning resources and student support

*Compliance with the standard: **full compliance***

Table 6 - Criteria to Standard 6

Nº	Subject of Evaluation	Mark
1.	Provision of the study programme with material and technical resources in accordance with the requirements of the curriculum (modern tools, equipment, computers, classrooms, laboratories)	A
2.	Availability of up-to-date library and information resources including those for independent study and research work	A
3.	Availability of infrastructure to ensure access to quality education to students with different opportunities and of different age, and to provide the development of social and educational component of the academic process	A
4.	The system of feedback on the satisfaction with conditions and organization of the study process should be in place	A
5.	Availability of accessible information about opportunities for student mobility and its support system	B

Analysis of the compliance of the cluster of educational programmes with the standard:

NSTU has a well-developed material and technical resources base for the implementation of all types of research and educational activities. When implementing the program, modern lecture halls, research laboratories, computer labs equipped with modern computers and the state-of-the-art software are used.

Depending on the topic of the thesis and the place of work of the scientific advisor, graduate students also have an opportunity to use the equipment and material base of partner organizations (Regional Electric Networks JSC, the KOTES-Engineering Company LLC, the Siberia-Mechatronica Company LLC, the Siberian Generating Company LLC, the COTES-Siberia Production Company CJSC, The ZiO-COTES Engineering Company LLC, the SibTekhEnergo Company JSC, the OSB KER-Engineering Company LLC, the UK RusEnergoMir Company

LLC, the NEP Company PJSC, the RusHydro Company JSC, the UES System Operator of Russia and its branches, the Institute of Energy Systems Automation JSC, the NPP Microprocessor Technologies Company LLC, the Bolid Company LLC, the ESTRA Group of Companies LLC, the Project Center of Siberia LLC, the NSK-Project Company LLC, the INPES Company LLC, the Erasib Company CJSC).

The Review Panel members visited educational laboratories, computer classes and lecture halls and noted that the programmes are well equipped with modern measuring and technological equipment regularly used in enterprises and organizations of the industry. The quality and variety of demonstration installations and visual aids (stands) allows you to conduct lectures, practical and laboratory classes at a high up-to-date methodological level.

The scientific library of NSTU widely uses advanced library technologies. Since 2004, the ILS VIRTUA Integrated Library System has been implemented in the NSTU library. It provides automation of all major library technological processes such as cataloging, book lending, ordering and acquisition, registration and accounting of serial publications, online access to the electronic catalog, and preparing reports.

Along with ILS VIRTUA, RFID technologies are actively used in the NSTU library. Free access to the library reading rooms stock and the delivery desk became possible due to the implementation of RFID technologies. The documents of the library stock have specialized library tags for radio frequency identification of documents.

During the visit to the University library the members of the External Review Panel were shown all the possibilities of the library system.

The educational organization has implemented a system of feedback from students, which is collected by various structural divisions of the University. One of the most effective methods is a survey organized during the academic year. The results of the ongoing procedures for assessing the quality of each educational programme are used by the programme management in order to make timely adjustments.

Achievements:

1. Availability of up-to-date facilities and resources: the interfaculty research laboratory of Quantum Cryogenic Electronics; the laboratory complex and design bureau of electromechanics; the metallographic laboratory; the thermal laboratory; the laboratory of automated electric drive; the electrotechnical laboratory; the laboratory of hydraulic and pneumatic control systems (NSTU and the Festo Company); the educational and research laboratory of energy and resource saving technologies; the educational and research laboratory "Production Mechanisms Automation; the research and educational center "Energocenter"; the Energy Efficient Mechatronics and Electromechanics engineering center;- the information and analytical center for innovation-driven development of energy; the research laboratory of low-potential energy; the center for testing monitoring and control devices of controlling modes of electric power systems; the center for energy saving and energy audit; the NSTU Energy Center; NSTU EnergoClassroom; the interdepartmental research laboratory for processing, analysis and presentation of data in electric power systems; the Automation of Power Systems Laboratory; the Educational Power Plant Laboratory; the laboratory "Testing Center for

Control and Mode Control Devices"; the digital multi-brand laboratory "Automation of Power Systems"; the laboratory "Engineering Center for Energy Efficient Electromechanics and Mechatronics"; the laboratory "Automation of Production Mechanisms"; the laboratory of industrial electronics and measurements; the training power plant laboratory, Relay protection and diagnostics; the laboratory of Relay Protection and Automation of Power Systems.

2. Availability of the scientific library (book stock of 1.6 ml. copies) equipped with advanced library technologies. Since 2004, the ILS VIRTUA Integrated Library System has been being implemented in the NSTU library, which makes it possible to make all major library technological processes automated;

3. Availability of developed infrastructure which meets the requirements of diverse student population: student dormitories, the Culture Centre, the Student Media Center, the Cybersport Club, the Youth Media Center "Yozhmedia", the Physics Experiment Theater, the Student Discussion Film Club "KiNETIka!", the Book Club "Buklya", the Skill Games Club, the Japanese Language and Culture Club, the Docendo Discimus Philosophical Club, The Garage student business incubator, Laboratory of Social Psychology, the sports and recreation camps "Sharap" and "Erlagol".

Recommendations:

1. It is recommend that the development and implementation of a system for informing students about the possibilities of international mobility should be developed.

2. A plan for continuous improvement and modernization of laboratory equipment should be developed.

3. The list of equipment presented in training laboratories with samples of devices and devices from various manufacturers that are widely used in the industry should be expanded.

4. The system for receiving "feedback" from students should be enhanced in terms of its regularity and the availability of information about the changes made to the programme.

3.7 Standard 7. Collection, analysis and use of information for managing the study programme

*Compliance with the standard: **full compliance***

Table 7 - Criteria to Standard 7

№	Subject of Evaluation	Mark
1.	Availability and effectiveness of the system for collecting and monitoring information about the study programme	A
2.	Participation of students and staff of the educational institution in collecting and analyzing information for managing the study programme	A
3.	The educational institution should have in place a unified effective information system on the basis of modern information technologies for managing the study programme	A

Analysis of the compliance of the cluster of educational programmes with the standard:

NSTU Information system was developed in 2004 and since then it has been constantly developing to cover the main business processes in the University life such as:

- work with the student body beginning with the work of the Admissions Committee to the graduation of specialists;
- educational process support in all aspects and at all stages of training;
- e-learning courses development;
- University staff management;
- campus dormitories management;
- management of the scientific activities of the University;
- management of the University financial activities;
- providing the University Administration with information on the educational process, the scientific and financial activities of the University, the formation of University-wide reports related to a comprehensive assessment of the University activities;

In order to receive feedback from potential customers of educational services, the Information System provides personal accounts for both students and employees. Within the framework of these resources, any participant in educational activities has the opportunity to express their opinion about its quality and make suggestions for its improvement.

Achievements:

1. Availability of modern digital environment for managing the educational process.
2. There is an integrated computer-aided system of data collection and processing, both in terms of general resource management and in terms of educational activities.

Recommendations:

1. Additional mechanisms and ways to involve students in the management of the educational program should be developed.

3.8 Standard 8. Public information

Compliance with the standard: **substantial compliance**

Table 8 - Criteria to Standard 8

Nº	Subject of Evaluation	Mark
1.	Effective use of the official website of the study programme for its quality enhancement	B
2.	Publication of complete and accurate information on the study programme and its achievements on the official website of the educational institution and mass media	B
3.	Publication of objective data on the employability of graduates	B
4.	Integration in the environment, interaction of the educational institution with different professional associations and other organization including those from abroad	B

Analysis of the compliance of the cluster of educational programmes with the standard:

The Information Policy Department was created at NSTU in 2018, which implements the University's communication.

The Information Policy Department publishes relevant information for students related to educational, research, sports, social, cultural activities in the social networks.

The NSTU Alumni Association has been established at NSTU-NETI. The Association was created with the aim to strengthen the position of NSTU in the educational services market; to support the spirit and traditions of NSTU-NETI; to improve the material and technical resources of the University; to promote the establishment of links between alumni and Alma Mater, especially in the field of research; to participate in such events as anniversaries of the University, faculties and departments.

During the meeting of experts with graduates of the educational programmes, detailed information was obtained about the forms and methods of participation of graduates in the development and implementation of educational programmes, their participation in the organization and conduct of educational and industrial practices of students and the preparation of final qualification papers.

Achievements:

1. Information about the educational programmes is available on the University's website;
2. Active involvement of the student community in social networks.

In 2018, the Department of Information Policy was established at NSTU, which carries out activities for the implementation of the University's communication policy (in the field of public relations, marketing, advertising, and media relations). Through the social networks "V Kontakte", "Instagram", Facebook, and the main website of the university the Department publishes relevant information for students related to educational, research, sports, social, and cultural activities.

Recommendations

1. It is recommended to significantly expand the English-language website of the NSTU and the Faculty of Energy with up-to-date information about the educational programmes, the order and conditions of training.
2. The websites of structural divisions of educational programmes should consider the possibility of creating sections on the employment of graduates with regularly updated information.

3.9 Standard 9. On-going monitoring and periodic review of programmes

Compliance with the standard: **full compliance**

Table 9 - Criteria to Standard 9

Nº	Subject of Evaluation	Mark
1.	Documented procedures of monitoring and periodic review of study programmes should be in place	A
2.	Availability of a feedback mechanism for students, employers, branch ministries and departments (key stakeholders in employment) in the process of monitoring and periodic review of a study programme	A
3.	Effectiveness of procedures for monitoring and periodic review of a study programme (enhancement of programmes)	A

Analysis of the compliance of the cluster of educational programmes with the standard:

The External Review Panel noted that the revision of the main professional educational programmes is carried out in order to comply with the requirements of the Federal State Educational Standard (as the requirements change) and also to take into account the latest scientific achievements.

At the same time, the Panel considers it important to note that special monitoring of employers' feedback on the quality of graduate training at the University is not carried out. However, the curriculum and content of individual disciplines (Design and Operation of Relay Protection Devices, Interface Devices

with the Object of Relay Protection and Automation, Relay Protection of Electric Power Systems, Emergency Automation, etc.) were developed with the participation of representatives of potential employer companies.

Achievements:

1. Procedures have been developed for the annual monitoring of educational programmes in order to improve them.
2. Opportunities for annual adjustment and updating of educational programmes based on the results of monitoring are used.

Recommendations:

1. It is recommended that the annual monitoring of employers on the quality of graduate training should be held.
2. It is recommended that syllabi of disciplines be reviewed by employers.

3.10 Standard 10. Cyclical external quality assurance of study programmes

Compliance with the standard: **full compliance**

Table 10 - Criteria to Standard 10

№	Subject of Evaluation	Mark
1.	Periodic review of a study programme	B
2.	Availability of a corrective actions programme to follow up the results of external evaluation of study programmes	A
3.	Consideration of the results of previous procedures of external evaluation when conducting subsequent external procedures	A

Analysis of the compliance of the cluster of educational programs with the standard:

Periodically, employers take part in independent assessment, evaluating the formation of professional competencies of graduates (through participation in the State Examination Boards, writing reviews of the research work of graduates), as well as by reviewing the content of the main educational programmes.

In 2021, Novosibirsk State Technical University entered the Premier League of the Subject National Aggregated Ranking for the field of disciplines 13.00.00 Electric and heat power engineering. This University ranking includes 6 ratings that meet the conditions of publicity, stability, mass character and periodicity:

1. Subject ranking based on the results of professional and public accreditation
2. Subject ranking " Assessment of the quality of training»
3. Subject by the Hirsch Index
4. RAEX Subject Ranking
5. Subject ranking "First Mission»
6. Subject GAR (Russian universities).

NSTU' s listing in the Premier League has been achieved through high marks, which the University has received in the following rankings:

- subject ranking "assessment of the quality of education" by the results of the Unified State Examination (open database of university performance and monitoring; research conducted by Higher school of Economics "Monitoring the quality of admission to the universities of the Russian Federation");
- H-index subject ranking, due to the high total h-index thematic areas (based on open data of the scientific electronic library e-library.ru);
- RAEX subject rating, due to the university's representation in thematic areas according to the RAEX rating agency;
- The "First mission" subject ranking, due to the number of the best programmes from the list of "Best educational programmes of innovative Russia-2021".

Achievements:

1. Educational programmes have passed state accreditation.

Recommendations:

1. It is recommended that a procedure for regular external evaluation of educational programmes should be developed by involving experts from employers.

4. RECOMMENDATIONS FOR IMPROVEMENT

Thus, based on the analyses of the presented documents, meetings and interviews, conducted during the online site-visit, with the purpose of enhancing the quality of delivering the educational programmes under review the Review Panel recommends:

1. It is recommended that representatives of employers, employers' associations, relevant regional ministries and departments should be included in the Academic Councils of the faculties and NSTU.

2. It is recommended that the system of receiving and analyzing information in the "feedback" mode from enterprises and organizations – the main consumers of graduates of educational programs– should be improved in order to make it regular for enhancing the quality assurance of training specialists.

3. It is recommended to improve the monitoring of market requirements and educational programmes in similar areas of training implemented in other technical universities in the region, in order to adjust and improve the educational programmes under accreditation.

4. It is recommended to extend the use and application of the DiSpace e-learning system by all categories of students and to all forms of training sessions.

5. In order to make students better informed about the educational programmes, it is recommended to expand and supplement the information about them on the University's website with a description of courses and disciplines, formative and summative assessment forms, information about the employment of graduates; significantly expand and supplement the information provided on the English version of the site (including information about the structure of Russian higher education).

6. In order to increase and expand the participation of students in academic mobility programmes, it is recommended to create a Mobility Support Center, organize systematic work to familiarize students with foreign and domestic universities, their programmes, opportunities and procedures for transferring credits; organize introductory lectures by representatives of other universities.

7. It is recommended to attract professors from the best foreign universities to conduct (including remotely) public lectures, master classes, consultations, etc.

8. It is recommended to design a training course on the strategic development of modern energy, where lectures could be conducted by representatives of regional energy and electrical enterprises.

9. It is recommended to expand the list of professional development programmes for university teachers, taking into account the need for them to master not only new information technologies, but also to familiarize themselves with the best practices in the profile of the disciplines taught.

10. In order to improve the financial incentives mechanisms, it is recommended to develop a system for accounting for the real time spent by the teachers on classroom teaching and other types of work (research, organizational and methodological, administrative).

11. It is recommended to develop a plan for the continuous modernization of laboratory equipment (including with the involvement of student projects); to expand the list of manufacturers of equipment used in the laboratories.

12. It is recommended to increase the involvement of students in the process of developing educational programmes; at the end of each semester, conduct a survey of students on the quality of the educational programme and the work of teachers.

13. It is recommended to introduce various methods of independent external evaluation of educational programmes (by employers ' associations, industry communities, associations of engineering education, methodological associations).

5. CONCLUSION

Based on the self-evaluation report analysis, documents and data submitted the External Review Panel has come to the conclusion that the educational programmes «Heat Power Engineering and Heat Engineering» (13.03.01), «Electric Power Industry and Electrical Engineering» (13.03.02, 13.04.02) **fully comply** with the accreditation standards and criteria of the National Centre for Public Accreditation.

The Panel recommends that the National Accreditation Board accredit the educational programmes «Heat Power Engineering and Heat Engineering» (13.03.01), «Electric Power Industry and Electrical Engineering» (13.03.02, 13.04.02) delivered by Novosibirsk State Technical University **for the period of 6 years**.

ANNEX A

SCHEDULE OF THE SITE VISIT OF THE EXTERNAL REVIEW PANEL

Time	Activity	Participants	Venue
April 27, Tuesday			
9.00	Arrival at the University		
Zoom conference LINK 1 https://us02web.zoom.us/j/86913528399?pwd=YmNRZyttTGxvcmVBUjFGSk5KbUJtUT09 Conference ID: 869 1352 8399 Passcode: 266824			
09.30 – 11.00	Tour of the University (library, tochka kipenia (boiling point), subject-specific laboratories)		Building I, 20 (hall), K. Marksa Prospect
11.00– 11.45	Work with documents, website, materials Visiting classes (optional)		Room 307, Building II 20, K. Marksa Prospect
11.45– 12.00	Break		
12.00 – 13.00 *07.00 – 08.00 (Germany)	Meeting of the ERP with the University administration and people responsible for accreditation	Rector, Vice-Rectors, people responsible for accreditation, ERP	Conference hall
13.00 – 14.00	Lunch		
Zoom conference LINK 2 https://us02web.zoom.us/j/89104374000?pwd=U205Q2hjdHFmZU1EMVUzQXlON3FEUT09 Conference ID: 891 0437 4000 Passcode: 300986			
14.00 – 15.00	Meeting with Deans	Deans, ERP	Room 308
15.00 – 15.10	Break		
15.10 – 16.10	Meeting with Heads of Departments	Heads of Departments, ERP	Room 308
16.10 – 17.00	Internal meeting of the Panel	ERP	Room 307
17.00 – 18.00	Meeting with graduates	Graduates, ERP	Room 308

Time	Activity	Participants	Venue
April 28, Wednesday			
10.00	Arrival at the University		
Zoom conference LINK 2 https://us02web.zoom.us/j/89104374000?pwd=U205Q2hdHFmZU1EMVUzQXlON3FEUT09 Conference ID: 891 0437 4000 Passcode: 300986			
10.00 – 11.00	Filling in individual assessment forms	ERP	Room 307
11.00 – 11.45	Visiting classes (optional)	ERP	
11.45 – 12.00	Break		
12.00 – 13.00 *07.00 – 08.00 (Germany)	Meeting with teachers	Teachers, ERP	Room 308
13.00 – 14.00	Lunch		
14.00 – 15.00	Meeting with students	Students, ERP	Room 308
15.00 – 15.10	Break		
15.10 – 16.00	Meeting with employers	Employers, ERP	Room 308
16.00 – 17.30	Filling in individual assessment forms, work with documents	ERP	Room 307
April 29, Thursday			
11.30	Arrival at the University		
Zoom conference LINK 2 https://us02web.zoom.us/j/89104374000?pwd=U205Q2hdHFmZU1EMVUzQXlON3FEUT09 Conference ID: 891 0437 4000 Passcode: 300986			
12.00 – 14.00 *07.00 – 08.00 (Germany)	Internal meeting of the Panel: discussion of preliminary results of the site visit, preparation of the oral report of the Panel	ERP	Room 307
14.00 – 15.00	Closing meeting of ERP with the representatives of the University	ERP, University administration, Heads of Departments, teachers, students, ERP	Conference hall
15.00 – 16.00	Lunch		
Departure			

ANNEX B

PARTICIPANTS OF THE MEETINGS

University administration, people responsible for accreditation:

№	Name	Position
1.	Anatolii Bataev	Rector
2.	Vasilii Yanpolskii	First Vice-Rector
3.	Sergei Chernov	Vice-Rector for Academic Affairs
4.	Viktoria Vikhman	Head of the Office for Licensing and Accreditation of Educational Programmes
5.	Yuri Nikitin	Head of the Education Management Office

Deans:

№	Name	Position
1.	Mikhail Vilberger	Dean of the Faculty of Mechatronics and Automation
2.	Aleksei Beloglazov	Dean of the Faculty of Power Industry

Heads of Departments:

№	Name	Position
1.	Dmitrii Pavliuchenko	Head of the Department of the Systems of Electric Power Supply for Enterprises
2.	Anastasia Rusina	Head of the Department of Electric Power Station
3.	Sergei Elistratov	Head of the Department of Heat Power Stations
4.	Denis Kotin	Head of the Department of Electric Drive and Automation of Production Units
5.	Nikolai Schurov	Head of the Department of Electric Complexes

Teachers:

№	Name	Position
1.	Valentina Liubchenko	Associate Professor, Department of the Systems of Electric Power Supply for Enterprises
2.	Dmitrii Shevtcov	Associate Professor, Department of the Systems of Electric Power Supply for Enterprises
3.	Oleg Tanfiliev	Associate Professor, Department of Electric Power Station
4.	Vladimir Glazyrin	Associate Professor, Department of Electric Power Station
5.	Mikhail Kuparev	Associate Professor, Department of Electric Power Station
6.	Pavel Schinnikov	Professor, Department of Heat Power Stations
7.	Aleksandr Dvortcevoi	Associate Professor, Department of Heat Power Stations
8.	Ekaterina Boiko	Associate Professor, Department of Heat Power Stations
9.	Ekaterina Kucher	Associate Professor, Department of Electric Drive and Automation of Production Units
10.	Vladimir Kaveshnikov	Associate Professor, Department of Electric Drive and Automation of Production Units
11.	Yuri Pankratc	Associate Professor, Department of Electric Drive and Automation of Production Units
12.	Aleksandr Aliferov	Head of the Department of Automated Electric and Processing Units
13.	Valerii Biriukov	Associate Professor, Department of Electric Complexes
14.	Boris Malozemov	Associate Professor, Department of Electric Complexes

Students:

№	Name	Position	Year
1.	Andrei Shalygin	13.04.02 – Electric Power Industry and Electrical Engineering	1
2.	Maksat Otuzbaev	13.04.02 – Electric Power Industry and Electrical Engineering	2
3.	Evgenia Igumnova	13.04.02 – Electric Power Industry and Electrical Engineering	2
4.	Viktoriya Fedorova	13.04.02 – Electric Power Industry and Electrical Engineering	1
5.	Denis Kornilovich	13.04.02 – Electric Power Industry and Electrical Engineering	1
6.	Ilya Chervotkin	13.03.01 – Heat Power Engineering and Heat Engineering	3
7.	Artem Tamarenko	13.03.01 – Heat Power Engineering and Heat Engineering	3
8.	Ramilia Sharipova	13.03.01 – Heat Power Engineering and Heat Engineering	3
9.	Sergei Zhuk	13.04.02 – Electric Power Industry and Electrical Engineering	2
10.	Daria Cheremshanova	13.04.02 – Electric Power Industry and Electrical Engineering	1
11.	Ilya Konusov	13.03.02 – Electric Power Industry and Electrical Engineering	4
12.	Maksim Chuprin	13.03.02 – Electric Power Industry and Electrical Engineering	4
13.	Kirill Kovalenko	13.04.02 – Electric Power Industry and Electrical Engineering	1
14.	Aleksei Stepanov	13.04.02 – Electric Power Industry and Electrical Engineering	2

Graduates:

№	Name	Place of work	Position
1.	Dmitrii Orlov	Regional Electric Power Networks, branch "Eastern Electric Power Networks"	Foreman
2.	Ivan Zuev	SC REMiS	Leading Engineer for Debugging and Trials
3.	Aleksandr Orlov	Engineering of Electric Power Systems	Engineer of 2 category
4.	Andrei Shinkarev	Siberian Centre of Engineering and Analytics	Chief Specialist
5.	Dmitrii Kochergin	LLC KOTES Engineering	Leading Engineer of the Department for Introduction of Innovation Technologies
6.	Egor Orel	GLK-Robotics	Executive Director
7.	Andrei Chervonenko	Second Gymnasium (Novosibirsk)	Handicraft Teacher
8.	Roman Lopatin	Schneider Electric	Engineer for Design Institutes
9.	Mikhail Mosin	SC TET-RS	Service Engineer
10.	Eduard Kuznetsov	Second Gymnasium (Novosibirsk)	Handicraft Teacher
11.	Vladimir Ivchenko	Factory of Software and Hardware Complexes	Head of Projects

Representatives of professional community:

№	Name	Position
1.	Andrei Sidelnikov	Head of the Department for Electric Power Transmission, "Elektomagistral"
2.	Denis Meniaykin	Deputy Head of Service "Regional Electric Power Networks"
3.	Andrei Loktionov	Head of the Office of Relay Protection, Automation and Metrology, branch of «RusGidro»-«Novosibirsk Hydroelectric Power Station»
4.	Vitalii Kuchanov	Chief Engineer, LLC KOTES Engineering
5.	Aleksei Gordeichik	Deputy Director for Electric Drive and Automation, LLC Siberia-Mechatronics
6.	Mikhail Nikulin	Deputy Head of the Department of Passenger Services of the Novosibirsk City Administration
7.	Olga Volkova	Chief Specialist of the Department of Primary Equipment, LLC Siberian Project Centre

ANNEX B

THE SCALE OF ASSESSMENT PARAMETERS OF THE STUDY PROGRAMMES

№	Standards	Assessment of the study programme			
		Full compliance	Substantial compliance	Partial compliance (needs improvement)	Non-compliance
1.	Policy (goals, development strategy) and quality assurance procedures of a study programme	*			
2.	Design and approval of programmes	*			
3.	Student-centred learning, teaching and assessment	*			
4.	Student admission, support of academic achievements and graduation	*			
5.	Teaching staff	*			
6.	Learning resources and student support	*			
7.	Collection, analysis and use of information for managing the study programme	*			
8.	Public information		*		
9.	On-going monitoring and periodic review of programmes	*			
10.	Cyclical external quality assurance of study programmes	*			