ASIIN Accreditation Report

Bachelor's and Master's Degree Programmes
Electrical Supply

offered by

Mongolian University of Science and Technology (MUST)

Last update: 06.12.2013

Basic information about the accreditation procedure

Degree programmes	Bachelor's and Master's Degree Programmes Electrical Supply
Higher Education Institution (HEI)	Mongolian University of Science and Technology (MUST)
Seals applied for	The Higher Education Institution has applied for the following seals and labels: • ASIIN Seal for the degree programmes • EUR-ACE Label
Peer panel	Prof. Dr.-Ing. Hans Martin Gündner, University of Applied Sciences Esslingen; Dipl.-Ing. Bernd Mühe, Senior Vice President ABB China; Prof. Dr.-Ing. habil. Dietmar Schulze, Ilmenau University; Prof. Dr.-Ing. Harald Weber, University of Rostock.
ASIIN Procedure Manager	Dr. Siegfried Hermes
On-site visit	The on-site visit took place on 18./19. September 2013.

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A Preliminary Remark

The on-site visit for the above mentioned degree programmes took place on 18./19. September 2013.

Prior to the talks with the representatives of the university, the peers met to prepare their questions and to discuss the self-assessment report. Professor Weber was asked to act as speaker of the audit team for the aforementioned degree programmes.

The peers had discussions with the following groups: University management, responsible managers of degree programmes, teaching staff, students, graduates and employer representatives.

Additionally, the auditors inspected the infrastructure and the technical equipment at Mongolian University of Science and Technology in Ulan Bator.

The following chapters relate to the Self Assessment Report (hereinafter SAR) provided in May 2013 as well as to the discussions and information provided during the on-site visit including samples of exams and final theses

The assessment and the award of the ASIIN-seal are always based on the European Standards and Guidelines (ESG) and the Subject-Specific Criteria of Technical Committee 02 – Electrical Engineering and Information Technology, valid at the time of conclusion of the contract. In case of the award of other seals or labels, the criteria of the respective seal or label-owner (ENAEE), are considered additionally.

As owner of the label ENAEE has authorized ASIIN to award the EUR-ACE® Label based on the „EUR-ACE Framework Standards for the Accreditation of Engineering Programmes". The assessment for the award of the EUR-ACE® Label is based on the General Criteria of ASIIN as well as on the Subject-Specific Criteria (SSC) of the Technical Committee 02 – Electrical Engineering and Information Technology.

The report has the following structure: Chapter B presents the facts which are necessary for the assessment of the requested seals. The information principally stems for the self-assessment report and related appendices provided by the Higher Education Institution. An analysis and separate assessments of the peers about the compliance with the criteria for the requested seals follow. The assessment of the peers is preliminary and subject to changes based the subsequent information. The statement of the HEI is included with the exact wording. The final recommendation of the peers is drafted after and based on the statement of the HEI (and additional documents, if applicable). The Technical Committee

makes a proposal for the accreditation decision (chapter F). The final decision is taken by the Accreditation Commission for Degree Programmes (chapter G).

Any gender-specific terms used in this document apply to both women and men.

B Report of the peers (Accreditation Report)

B-1 Formal specifications

a) Name and awarded degree	b) Profile	c) consecutive / further education (for Master's)	d) Study mode	e) Programme Duration & Credit points	f) First & annual enrollment	g) Expected intake	h) Fees
Electrical Supply B.Eng. in Electrical Supply	n.a	n.a.	Full time	8 semesters 135 Credit hours (1 Credit hour = ca. 1.7 ECTS)	Winter semester 2009/10 Winter semester	40 p.a.	To be set by MUST Board Meeting, p.a. and per Credit hour; 2011: ca. 36000 tugrug (1 EUR = ca. 2000 Tug)
Electrical Supply M.Eng. in Electrical Supply	n.a	n.a.	Full time / Part time	4 semesters 37 Credit hours	Winter semester 2009/10 Winter or spring semester	25 p.a.	see for the Bachelor's programme; 2011: ca. 55000 tugrug

Analysis of the peers:

In general, the name of the study programmes reflects the study aims and learning outcomes the HEI has committed itself to. Also, the name, by and large, reflects the disciplinary content of the study programmes. Admittedly "electrical supply" doesn't exactly denominate the meaning and disciplinary content of the programmes. As opposed to other forms of non-electrical energy supply (mechanical or hydraulic, for instance), the programmes might be more specifically referred to as "Electrical Power Supply". Otherwise the decision to label the programme as "Electrical supply" might partly be ascribed to the School's of Power Engineering organizational structure and the distribution of competences for its study programmes amongst so-called professors' teams, i.e. small groups of professors related to certain fields of professional/disciplinary expertise (as to that see chapters B-2-2 and B-2-6).

The expected intake per semester / study year seems to be realistic regarding the quoted numbers of students and graduates, the group size of courses/modules, or the actual workload of teachers (according to the SAR).

Awarded degree and tuition fees are within regular range, thereby taking into account that fees are payable per credit hour. It is also recognized that there are opportunities for waiving fees by outstanding performances (for instance, in the course of specified competitive cultural or sports events).

Concerning the study form of the Bachelor's programme, the HEI clarifies on request that the differentiation of a "Day-time-" and a "Night-time"-version of the programme has been an extraordinary organization measure in order to absorb an unexpected influx of students into the programme, which were delegated from the College of Civil (Engineering) and Construction in 2010. As to the Master's programme, the HEI stresses that the comparatively low ordinary workload of students per semester (of 9 to 10 credit hours) primarily aims at allowing master students, who reportedly are mostly employed at this time, the opportunity to flexibly organize and plan their courses (for instance, concentrate their labs on two days in a week etc.). Consequently, this study mode might be more precise labelled as "part time" or "extra-occupational", and it comes close to what is called a "further education-master's programme" in Germany.

In this context the programme coordinators pointed out that individual study plans of students (Bachelor as well as Master students) are controlled by appointed student advisers (see chapter B-3-4).

Assessment of the peers:

For the award of the ASIIN seal

Criterion 1 Formal specifications

The peers deemed the relevant items of the above mentioned criterion to be fulfilled, in general. Nevertheless due to reasons specified above, they recommended reconsidering the programme name with respect to its primary disciplinary subject ("*electrical power supply*").

B-2 Degree Programme: content concept & implementation

B-2-1 Objectives of the degree programme

As **objectives of the degree programmes** the institution states the following (according to SAR; also in programme-related flyers provided during the audit discussions):

The aim of Bachelor's degree programme Electrical Supply "is to prepare [an] electrical engineering specialist [at an] internationally recognized level, who had gained the theoretical and practical knowledge of installation and optimal operation of electrical and energy facilities / equipment which [is] necessary for supplying the energy consumers with reliable and high quality electrical energy. Graduated students i) have certain knowledge on […] computer applications, automation of technology and business administration, ii) are able to continue [with the] next step of higher education – [the] master degree study in foreign (English) language, iii) have a passion for self-advancement, and IV) have the academic and technical higher education level of […] general qualification profiles laid down at national and international level, meeting the European higher education requirements."

The aim of Master's degree programme Electrical Supply "is to prepare the electrical engineering specialist, who had gained the skills for research and professional practical solutions faced with electrical supply engineering, [to enable his] full understanding of the technical performance of all energy facilities and technologies used for [the] present-day energy sector, and the competences in particular major specialt[ies] for working [at] an internationally recognized level. Graduated students are i) able to carry the research activities using modern technology and techniques bas[ed] on [students'] foreign language proficiencies and engineering mathematics knowledge, ii) able to continue [the] next step of higher education – doctoral degree study, iii) have the academic and technical higher education level of […] European higher education requirements for master degree holders."

Thus, graduates in the field of electrical supply are supposed

- to work as energy system technicians, plant and process engineers at power utilities and power plants;
- to be responsible for the engineering, construction, operation and maintenance of electrical transmission and distribution companies, or renewable energy plants;
- to be responsible for the building services engineering;
- to work as energy consultants;
- to work as product managers with applicable guidelines, regulations and standards of electrical energy;
- to be hired as test and development engineers by research and testing institutes;
- to work as high voltage engineers;
- to work as electrical engineers in industry or communal services;

- to work as a teacher/lecturer in high schools or universities (graduates of the Master's programme only).

The above mentioned study objectives are published on the websites of the Power Engineering School of MUST as well as in the "Student Handbook" and other media.

Analysis of the peers:

Generally, the HEIs classification of the final degree in the Bachelor's respectively Master's programme seems plausible in academic terms, because the description of the Bachelor's respectively Master's level of education in the light of, for instance, the European Qualifications Framework appears to be reasonable. Otherwise, the skills and competences of graduates of the respective programmes – though sufficiently indicating the different levels of education – aren't suited to substantially specify the qualification profile of graduates of each programme in a more distinguishable manner. It only results as a consequence that the explicitly indicated fields of professional work come without any differentiation regarding the level of education (i.e. Bachelor's or Master's degree), and most comprehensively encompass all kinds of occupation in the area of energy supply. In consequence, the occupational profile for the degree programmes in Electrical Supply might be defined more differentiating as well as more programme-specific. On both counts this depends on how precise the intended learning objectives are formulated for each study programme in the sense of a programme-specific qualification profile (see following chapter).

The study objectives of the degree programmes are accessible to students, lecturers and other stakeholders as indicated above.

Assessment of the peers:

For the award of the ASIIN seal

Criterion 2.1 Objectives of the degree programme

The peers judged the above mentioned criterion as already met. Generally, the given occupational profile reflects the actual market needs in Mongolia, the more so, since there are no local manufacturers of electrical equipment available. At the same time, the peers conceded that an identification of meaningful occupational profiles for the graduates of the Bachelor's respectively the Master's programme Electrical Supply is closely linked to the proper definition of programme-specific *learning objectives* (in the sense of individual qualification profiles).

B-2-2 Learning objectives of the programme

As **intended learning objectives of the degree programmes** the institution states (according to SAR; also in programme-related flyers provided during the audit discussions):

Graduates of the Bachelor's study programme Electrical Supply

- have knowledge and skills in providing normal operating conditions for commercial and industrial building electricity supply;
- are able to build, install and use electrical equipments in technical [plants] and at other sites;
- have a certain level of knowledge in foreign language, automation and management of industrial technology processes, and
- are able to lead a team of professionals.

Graduates of the Master's study programme Electrical Supply

- have advanced theoretical knowledge,
- are able to use automation equipment, computer programme software and techniques of inventing new things, and
- are able to fluently read and understand published materials in foreign languages.

Additionally (*regardless of the level of qualification)*, as learning objectives for both programmes the HEI refers to the graduates' ability

- to develop electrical energy concepts;
- to plan [design] lighting, heating, ventilation and air conditioning systems for buildings;
- to develop monitoring concepts for the automatic operation and output control of electrical energy systems;
- to manage projects and plants (Master's graduates only).

The intended learning objectives are published on the websites of the Power Engineering School of MUST as well as in the "Student Handbook" and other media.

Analysis of the peers:

At a first glance, the stated learning objectives correspond to the above mentioned study objectives and the level of qualification sought. But in doing so, they largely confirm the

impression that the intended skills and competences of Bachelor and Master graduates amount to very broad, but still comparatively unspecific qualification profiles. Although one might conclude that these qualification profiles match the above mentioned job descriptions for graduates perfectly well, this result itself is found to be disputable. Even a thorough reading of skills and competences, students are expected to acquire in the related programme, barely conveys a clear idea of the subject specific qualifications of graduates. Thus, not only does the qualification profile of the Bachelor graduate appear to be more concrete, and partly even more demanding than that of the Master graduate; it also seems to be largely confused with the Master's programme qualification profile when taking into account the disciplinary skills and competences *additionally stated for both programmes*. The resulting profiles then are – as has been pointed out – substantially indistinguishable in level and scope. One gets the impression that Bachelor as well as Master graduates are fully and in equal manner qualified for all professional fields relating to the energy supply area.

But considering the curriculum of each programme and related explanation of the programme coordinators in the audit discussions, it is without doubt that the qualifications of graduates are more differentiated and also more limited in the disciplinary field of power engineering. Not all of the four main subsystems of power engineering (generation, transmission, distribution, and utilization subsystem) are evenly dealt with in the Electrical Supply programmes, as one might expect. In a nutshell – but not at all that clear from the wording of the learning objectives –, the distribution and utilization subsystems are at the centre of the programmes, while at the same time subjects, and consequently competences, in the field of the generation and transmission subsystems are not or only superficially dealt with. The audit discussions also brought to light, for instance, that certain aspects of the distribution subsystem, like the project planning of substation equipment (transformers, relays circuit breakers etc.) and related competences, take only second place in the curriculum. As to the generation subsystem, it seems noteworthy that so-called renewable energy systems are as well embraced only marginally, as it seems. To be sure: All this consequently and consistently follows from the indication of the peculiar curriculum design of the Electrical Supply programmes – deviating significantly from conventional western-style Power Engineering programmes. Therefore it is owed, in the first place, to the organizational structure of the Power Engineering School dividing the School into two departments "Energy Sectors" and "Heat Sectors", and, again, subdividing the Energy Sectors-Department in four professorial teams: Electrical Systems and Energy Management, Electrical Supply and High Voltage Technique, Electrical Systems Automation and Electronic Systems who, in turn, treat the divergent aspects of the electrical power supply-topic in teaching and research. That way, the aforementioned subdivisions

take responsibility for planning and carrying through the study programmes of the School of Power Engineering. It could be learned from the SAR and the HEIs comments that the professors' team Electrical Systems and Energy Management is in charge of the study programmes Electrical Systems and Energy Management, the professors' team Electrical Systems Automation, *inter alia*, of the study programme Power Electronics, the professors' team Heat Transfer and Thermodynamics (Department Heat Sectors) of the study programmes Power Station, Industrial Ecology and Renewable Energy, and so on. This is not about arguing whether the said organizational structure of the Power Engineering School (or the conceptual design of its study programmes) is responsive to the future demands of the Mongolian electrical power supply. Rather, this structure and design – irrespective of any other shortcomings in the study programmes under consideration – must be reflected more accurately in the definition of learning objectives of the respective degree programmes. Additionally, in order to plausibly demonstrate the implementation of the learning objectives in the curriculum a revision of the provided "objectives matrix" is also considered indispensible, since its focus is almost entirely confined to the learning outcomes of the courses/modules.

The HEI pointed out that, on principle, the relevant stakeholders (in particular, lecturers, students, graduates and companies) participate in the process of defining the study and learning objectives of the programmes. Whether the stated feedback loops between students and graduates on one side and the HEI on the other work effectively in the sense of enabling a periodic assessment and, if necessary, adaptation of the intended objectives and/or curricular content remains unclear from the information available so far (see below chapter B-6-1). Contrarily, in the light of the audit discussions and certain institutional arrangements the input of the energy branch could reasonably be assumed (see below chapter B-2-4).

The aforementioned learning objectives *in the current version* are accessible to the relevant stakeholders, particularly lecturers and students, in a way that students are able to appeal to them (for example in the scope of the internal quality assurance system).

Assessment of the peers

For the award of the ASIIN seal

Criterion 2.2 Learning outcomes of the programme

The peers considered the relevant requirements of the above said criterion *not yet fulfilled*. They came to the conclusion that learning objectives for each study programme have to be defined programme-specific in the sense that they should indicate more precisely the skills and competences graduates should have acquired after completion of the

programme ("qualification profile"). Furthermore, they considered it necessary that the HEI plausibly demonstrates in an "objectives matrix" how these learning objectives are adequately reflected in the learning outcomes of the individual modules. From the peers' perspective, the *revised* learning outcomes also need to be communicated and made accessible to students, and finally, to be regarded in the appropriate Diploma Supplement as well.

Assessment for the award of the EUR-ACE® Label:

As stated above, the peers generally concluded that the learning objectives for the study programmes in Electrical Supply need to be revised. Otherwise, the indented learning objectives and the prospective qualification profiles of the Bachelor and Master graduates have, by and large, been clarified by the programme coordinators and lecturers during the audit discussions. From the peers' perspective, the deficits of the wording insofar to a certain point reflect the peculiar structure of the Power Engineering School and its study programmes. Consequently, what appears to be unsatisfactorily to them isn't this structure, but rather the definition of learning objectives barely reflecting it.

Thus, the peers deemed that the intended learning outcomes of the Electrical Supply-programmes, as more clearly outlined and understood in the comments of the HEI, all in all comply with the engineering-specific part of Subject-Specific Criteria of the Technical Committee 02 – Electrical Engineering and Information Technology. Correspondingly, the peers also considered the learning outcomes in the categories „Knowledge and Understanding", "Engineering Analysis" (with reservations, see below B-2-6), „Investigations", „Engineering Practice", and „Transferable Skills" to be appropriately addressed in the curricula. However, competences in the „Engineering Design" field are scarcely addressed in both programmes, although some initial steps have been made in the modules *Power Electronics and Converting Technique* and *Electrical Network and Energy System* (Bachelor's programme), and in the elective module *Design of the Drawings of Electrical Supply* (Master's programme), the latter one, in turn, being prepared in the elective modules *Special Course on Electrical Supply* and *Calculating Methodology of Electrical Lighting* (as to that see also B-2-6).

B-2-3 Learning outcomes of the modules/module objectives

The **objectives of individual modules** are defined in the module descriptions (course descriptions / module database etc.). These module descriptions are not yet accessible to students in the version provided beforehand for the purpose of the audit visit. However, students are comprehensively informed about courses/modules in a "Student Handbook". According to the SAR, this handbook includes the Bachelor's and the Master's pro-

grammes outline, it's course syllabus, credit loads of modules/courses (categorized as *general education*, *professional general* and *qualification courses*, *mandatory* and *elective courses*).

Analysis of the peers:

First of all, it can be noticed that, generally, in the name of the study programme Electrical Supply is referred to as "Module Name", while the appropriate teaching and learning units are called "courses". The "courses" of the said programmes, to be sure, in fact equate to "modules" in the proper Bologna terminology. Now, since the presentation and documentation of the study programmes in English form part of an international orientation of the HEI's strategy – being confirmed by the accreditation procedure under way – it will be necessary to provide for a complete and consistent documentation in English as well. Therefore, the respective column in the module descriptions should be addressed to as "Name of study programme" or "Name of degree programme" instead of "Module Name".

In principal, the module/course descriptions are aimed at giving a reasonable idea of the learning outcomes students are expected to acquire in the individual modules. However, in some module descriptions the defined learning outcomes appear to be rather unspecific or, otherwise, unrealistic in scope (for instance, the module descriptions in Mathematics and Physics). But then, there are many module descriptions in the electrotechnical field proposing learning outcomes that are both realistic and adequately differentiating knowledge, skills and competences (take for example the modules *Electrical Measurement Technique*, *Power Electronics and Converting Technique*, *Electrical Supply for Industrial Enterprises* [M.TD316], *Automatic Control of Electrical Motors* [M.TD353], and *Installation and Operation of Electrical Equipment* [M.TD324]).

As has been indicated already, the "objectives matrix" in the course of the accreditation is, generally, conceived to be a useful instrument not only for (external) peers but also for the curriculum developers and lecturers in assessing whether the modules/courses of a study programme plausibly render the learning objectives formulated for this programme to be convertible. This purpose requires that the learning outcomes of the modules/courses (in the light of their subject specific content) are related to the learning objectives defined for the study programme as a whole. The "objectives matrix" the HEI provided for the accreditation procedure doesn't really suit these demands, since it largely summarizes the modular learning outcomes without relating the intended learning objectives for the programme as a whole. In order to allow for a more accurate assessment of the implementation of the qualification profile (learning objectives of each study

programme), an "objectives matrix" also reflecting the revised module descriptions should prove just that.

Apart from these aspects, some other points may be considered to be amendable. Thus, with regard to the utilization of substantially identical modules in different study programmes which could be freely elected by students of these programmes (just because being taught by other lecturers at different times), it might be helpful for students' study planning to know whether a module/course is offered in another study programme too, and, of course, which programmes are affected in every such case specifically. Furthermore, it has been found that some module descriptions are simply missing and need to be added (mainly regarding to industrial internships (Bachelor's programme) and graduation works (both programmes)). Eventually, the nomination of modules/courses in the documentation, i. e. the module handbook and the study plans respectively, differs on occasion, in the English translation at least. However, consistency of the wording in the information provided in English – as in the original Mongolian language –is indispensible.

As has been confirmed in the audit discussions by both programme coordinators and students, the module descriptions sampled in a module handbook for the purpose of the accreditation procedure aren't yet accessible to the relevant stakeholders (students and lecturers for that matter). Nevertheless, students considered the information about the study plan, the modules/courses and organizational aspects of the study course given in the "Student Handbook" to be instructive and helpful.

Assessment of the peers:

For the award of the ASIIN seal

Criterion 2.3 Learning outcomes of the modules/module objectives

The peers considered the requirements of the above cited criterion not fully met. With respect to the deficits referred to above, they deemed it indispensable to update the module/course descriptions accordingly. This includes providing for an "objectives matrix" proving plausibly the implementation of the learning objectives in the curriculum of the respective study programme (see also above chapter B-2-2).

B-2-4Job market perspectives and practical relevance

According to SAR, in order to provide sufficient energy supply to meet the demands of the expected energy consumption between 2015-2030, Mongolia is supposed to built several more coal power plants relying on its vast coal reservoir; the Bachelor's and Master's pro-

gramme Electrical Supply are considered to play an important role in preparing skilled professional workers for the different energy sectors.

Furthermore, the HEI states in its SAR that it views the Ministry of Mineral Resources and Energy as well as its related public offices, public and private enterprises in the energy sectors as main stakeholders (apart from the students and those people interested in studying at the School of Engineering). Thus, the programme coordinators regard the input and recommendations of the said stakeholders as worthwhile in preparing programme standards and curricula, inter alia. Therefore, according to the HEI, at least two representatives from employers and industrial sectors must be appointed to the National exam board of professional degree programmes in order to increase their involvement and provide external evaluation to the programme outcomes.

Practical relevance of the programmes shall be achieved by lab courses within most of the technical modules, in two industrial internships (with a duration of 2 respectively 3 weeks after the third year (Industrial internship I) and in the last semester (Industrial internship II) in the Bachelor's programme), and in the graduation project (Bachelor's programme) or the Master degree research work, respectively.

External industrial placements are organized and, according to the programme coordinators' indications during the audit talks, counseled by the HEI (although with regard to students' advice and counseling no binding rules seem to be in place).

Analysis of the peers:

The programme coordinators and representatives of cooperating companies plausibly made the case for a significant demand on the labour market for graduates of the Energy supply- and related programmes. Regarding this, the overall impression is that the HEI maintains close contacts with many companies on a regional and national scale, thus providing lots of opportunities to carry out practical trainings as part of the curriculum, but also, in principal, to engage in applied research cooperation with financial support or physical equipment provided by companies. Representatives of the companies also reported that they principally are free to suggest conceptual further developments of the programmes according to newly arising technological demands of the industry. They pointed to certain subject areas like, for instance, electrical safety procedures, where companies proposed to strengthen the relevant competences of graduates so as to better match those demands. Additionally, the SAR as well as the audit discussions brought to light that trilateral talks with the Ministries responsible for the energy sector and companies take place on a regular basis thus keeping the further development of the said study

programmes in pace with technological progress. This cooperation might even be considered institutionally embedded in the obligatory participation of industry representatives in the university's boards of examination.

On principle, the practical training offered (projects, laboratories and industrial placements) is appropriately linked to professional practice. However, as representatives of the companies confirmed, the temporary duration of the industrial placements in the Bachelor's programme (3 resp. 4 weeks time effectively) is, as a rule, too short to acquire the already demanding learning outcomes issued in detail in the appropriate student practice guidelines. Furthermore, neither these guidelines nor the audit discussions were getting really specific about the scientific preparation of the students to successfully carrying through an industrial placement. Students admittedly benefit from their lab experiences, and the requirements for the industrial placements are formally checked by laboratory engineers. But apparently no particular propaedeutic courses in this respect are foreseen yet.

The missing module descriptions for the industrial placements within the study course have been addressed already.

Assessment of the peers:

For the award of the ASIIN seal

Criterion 2.4 Job market perspectives and practical relevance

The peers concluded that, in general, the requirements of the above mentioned criterion are met sufficiently. Particularly, they appreciated that the HEI maintains close ties with companies of the energy sector. Nevertheless, they suggested a more systematic preparation and prolonged duration of the industrial placement modules in the Bachelor's programme in order to effectively support the profession-oriented competences of students.

B-2-5 Admissions and entry requirements

Bachelor's degree programme Electrical Supply

All students who completed 11 years of general education are allowed to take the general examination. Everybody interested to enrol in higher education institutions Bachelor's and Master's Degree programmes of "Electrical Supply" may take the general examination. Scores of general examination is assessed by 800 points system. General examination is organized by the Education Assessment Centre of the Ministry of Education and Science. He/she who has taken general examination via this centre can enrol to Mongo-

lian University of Science and Technology (MUST) depending on his general examination achievements. Students willing to study in Electrical Supply Engineering must fill in an enrolment application for MUST in Group I which requires 100% (maximum) on mathematics and 50% (maximum) on Physics which equal to 800 points and 400 points respectively. Minimum scores or points for enrolling to MUST are called "Threshold points", which are fixed and officially announced by the Training Policy Coordinating Department of MUST every year.

Master's degree programme Electrical Supply

The enrolment of master degree-students to MUST requires a bachelor degree on a certain (related) profession and / or another recognized academic degree amounting to at least 135 (Mongolian) CP and a GPA of 2.5 at a minimum.

According to comments of the HEI in the audit talks, the MUST-regulation on the credit transfer system ensures that activities completed at other HEIs could be fully recognized provided that the learning outcomes are essentially equivalent to those of the modules to be substituted. Achievements of students coming from other institutes or colleges, which are already accredited by Mongolian National Council for Education and Accreditation, are eligible to full acknowledgement without further assessment.

Analysis of the peers:

One of the issues discussed with the representatives of the HEI has been to what extent the admission requirements have an impact on the quality of the degree programme.

In this respect, the largely preparatory first year of the Bachelor's programme can reasonably be characterized as a means to ensure that students meet the necessary prerequisites to achieve the intended objectives of the respective study programme. This appreciation notwithstanding, the sheer quantitative range of *non-technical* higher education general courses (up to, at least 15 credit hours) may be disputable (as to that see further below chapter B-2-6). However, in conjunction with the provisions applying to the transfer of students from one semester to the next, and those regulating the possibility of retaking exams the HEI is evidently aiming at supporting the students in achieving the intended learning outcomes. Generally, it is found that the applicable regulations are transparent and accessible to all stakeholders involved.

As to the recognition of qualifications gained in other institutions of higher education, specifically abroad, the HEIs indication that external activities are recognized depending on their outcome-oriented substantial equivalency to courses/modules to be substituted,

couldn't be verified as a binding regulation. In principle, such regulation is meant to encourage and support the mobility of students as one of the most important underlying goals of the ASIIN general criteria (for that matter cf. in particular: Section III "Convention on the Recognition of Qualifications concerning Higher Education in the European Union" which the ASIIN criterion 2.5 is referring to in particular).

Assessment of the peers:

For the award of the ASIIN seal

Criterion 2.5 Admission and entry requirements

The peers judged the said criterion as being addressed quite adequately, though not fully yet with respect to the recognition of activities completed externally. As to the latter, the peers stated that rules for the recognition of activities have to be adopted especially with a view to internationalization and, in particular, the mobility of students ("Lisbon Convention"). The HEI is kindly requested to prove otherwise in its statement, if peers should have missed the respective rule or regulation. (The document "Student transfer regulations / Rector's 62 order on February 28th 2003", referred to in the SAR, might be clarifying but has not yet been accessible to peers.)

B-2-6 Curriculum/Content

Curriculum of the Bachelor's degree programme Electrical Supply

1A SEASON			
	S.MT101	Mathematics I	3
	S.PH101	Physics I	3
	S.ED101	Visual geometry	3
	S.RL101	Russian language I	3
	S.CS101	Computer usage I	3
	Elective Courses		1
	Total		16

1B SEASON			
	S.MT102	Mathematics II	3
	S.PH102	Physics II	3
	S.EL102	English II	3
	S.CS101	Computer usage II	2
	A.EDM202	Technical drawing	2
	S.PT101	Physical training	3
	Elective Courses		3
	Total		19

2A SEASON			
	S.EL210*	English III	3
	S.MT103	Mathematics III	3
	M.TD202	Theory of Electrical Circuit I	3
	M.EC234	Electronics	3
	M.TD207	Electro- technical materials	2
	S.PM101	Theory of Economics	3
	M.AU205	Electrical measurement technique	2
	Elective Courses		2
	Total		19

2B SEASON			
	M.TD203*	Theory of Electrical Circuit II	3
	M.TD208	High voltage engineering	3
	M.TD205	Electrical machine I	3
	S.SS102	Mongolian history	3
	Elective Courses		5
	Total		17

3A SEASON			
	M.TD204	Theory of Electrical Circuit III	2
	M.TD206	Electrical machine II	3
	M.ES210,	Electro- magnetic transient process	3
	M.TD212	Electrical network and energy system	3
	M.EC233	Power electronics, converting technique	3
	M.EL310	Professional English	2
	Elective Courses		5
	Total		17

3B SEASON			
	M.TD353	Automatic control of electrical motors	3
	M.TD316*	Electrical supply of industrial enterprises	3
	M.TD209	Equipment for electrical transmission and distribution	3
	M.TD306	High Voltage testing and calibration	2
	M.TD313	Diesel Power Plant	3
	M.TD214	Industrial internship I	1
	Elective Courses		2
	Total		17

4A SEASON			
	M.TD311	Electrical lighting	2
	M.TD318	Electrical supply of urban and settlements	2
	M.TD319	Methods of electrotechnology	3
	M.TD320	Course projection on Electrical supply	2
	Elective Courses		4
	Total		13

4B SEASON			
	M.TD310	Safety procedures with electrical equipment	2
	M.AU313	Automation and relay ptotection of electrical supply	3
	M.TD317	Electrical drive	3
	M.TD315	Industrial internship II	2
	M.TD330	Bachelors diploma work project	5
	Elective Courses		0
	Total		15

List of elective courses in the Bachelor's degree programme:

B. Elective courses		B6		
Natural science				
5.PH104	Foundations of Nano Science	3		Elective
Social science				
S.SS103	Foundation of political studies	2		Elective
S.SS113	Foundation of psychology	3		Elective
S.SS114	Foundation of Sociology	3		Elective
Humanities				
S.EG101	Ecology, environmental protection	3		Elective
S.EL001.	English I	2		Elective
S.ML103	Language Studies	2		Elective
S.RL101	Russian	2		Elective
S.RL102	Russian II	3	S.RL101	Elective
S.35001	Personal development	2		Elective
S.SS101	Foundations of philosophy	3		Elective
S.SS104	Mongolian language	1		Elective
S.SS109	foundation of cultural studies	2		Elective
S.SS112 Ethics		2		Elective

B.Elective courses		B6		
S.RL210"	Russian III	3	S.RL102	Elective
S.CS201	Program language	3	S.CS102	Elective
S.PM211	Business systems and registration	2	S.PM101	Elective
S.PM212	Branch management	3	S.PM101	Elective
M.AU258	Microprocessors technique	2	M.EC234	Elective
A.ED205	Engineering topography and automation	2	S.EDM202	Elective

B.Elective courses

M.ES307	Electricity saving	3	M.TD316	Elective
M.TD314	Special course electrical networking	3	M.ES210	Elective
M.TD324	Installation and usage of electrical equipment	2	M.TD209	Elective
M.TD325	Internal electrical network of buildings	2	M.TD212	Elective
M.AU321	Technology process and automation	2	M.AU313	Elective
M.ES323	Electrical Mechanic Transfer Process	2	M.ES210	Elective
M.RL310	Professional Russian Language	2	S.RL210	Elective

Curriculum of the Master's degree programme Electrical Supply

1 SEASON			
	S.CS701	Software for engineering simulations	2
	S.MT719	Theory of probability and mathematical statistics	3
	S.SS701	Technical philosophy	2
	S.PS701.	Methodology of research work-I	1
	Elective courses		2
	Total		10

2 SEASON			
	S.PS702	Methodology of research work-II	2
	M.TD703	Programming and calculation algorithm for electrical supply	2
	M.TD708	Modern testing and measuring devices	2
	M.TD709	Quality and consumption states of electrical energy	2
	M.TD715	Seminar on research work-I	1
	Elective courses		3
	Total		12

3 SEASON			
	M.TD704	Automatic control of technological process	3
	M.TD716	Seminar on research work-II	1
	Elective courses		3
	Total		7

4 SEASON			
	M.TD717	Seminar on research work-III	1
	S.FL701	Final examination of Foreign Language	1
	M.TD714	Master degree research work	6
	Elective courses		0
	Total		8

List of elective courses in the Master's programme:

A. Elective courses:		6/6		
M.ES702	Modern methods for electrical system calculations	3	M.ES703	Optional
M.ES719	Modern methods of electrical station operating states calculations	3	M.TD212	Optional
M.TD702	Renewable energy sources	3	M.TD313	Optional
M.TD705	Operation and reliability of high voltage equipment	3	M.TD306	Optional
M.TD706	Design of the drawings of electrical supply.	3	M.TD320	Optional
M.TD707	Special course on electrical machine	2	M.TD317	Optional
M.TD710	Special course on electrical supply	3	M.TD703	Optional
M.TD711	Calculating methodology of electrical lighting	2	M.TD311	Optional
M.TD712	Modern electrical drive	2	M.TD317	optional
M.TD713	Determination of energy losses in electrical system	3	M.TD212	optional

Students of the Master's degree programme Electrical Supply must choose their research theme when enrolling in the programme, and depending on theme they are supposed to select their elective courses adequately.

Analysis of the peers:

The HEI's peculiar approach to power engineering realized in the Electrical Supply-programmes has been intensively discussed in the audit talks and, indeed, figured as single underlying reference of ultimately all questions relating to the substance of the curricula. All parts, that is to say, all (sub-)systems and components of the discipline seem to be addressed at least superficially in one or the other module/course of the programmes. Hence, none of the generation, transmission, distribution, retailing or utilization systems and their related range of devices (such as transformers, electric generators, electric motors, or power electronics) has been fully left out of the curriculum. But to sum up, the generation and also the transmission systems aren't treated at the same depth as are the distribution and utilization systems. In the first place, as has been mentioned previously, this is due to the organizational structure of the School of Power Engineering which is peculiar in this respect (and reminiscent to the Russian-style concept of Power Engineering).

Accordingly, it turned out (and has been detailed in the audit talks) that the disciplinary scope and curriculum of the programmes under consideration are deeply rooted in the organizational structure of the School of Power Engineering (see also above chapter B-2-2). The School of Power Engineering is divided into two "departments" representing the "Energy Sectors" on the one side and the "Heat Sectors" on the other. These, in turn, are subdivided in altogether seven so-called professors' teams, each of them being account-

able for subject specific degree programmes. While the "Electrical supply and high voltage engineering"-professors' team is in charge of the Electric Supply-programmes, the "Electrical Systems and Energy Management"-professors' team takes responsibility for the study programmes Electrical Systems and Energy Management, the "Heat Transfer and Thermodynamics"-group for the study programme Power Station, the "Electronics Systems"-group, *inter alia*, for the study programme Power Electronics, and the "Industrial ecology and renewable energy" professors' team for the degree programmes Industrial Ecology respectively Renewable Energy. Consequently, when asked about specific methodical aspects closely related to issues of the maintenance and stability of the power grid as part of the transmission system (for instance, load-flow-calculation), the programme coordinators either point to some elective courses or (mainly) to other study programmes of the School of Power Engineering (like, in this case, the Electrical (Power) Systems programme?) dealing more intensively with advanced methods (like load-flow-calculation) attributed intrinsically to the transmission system. To a lesser extent, this argument also applies to the comparatively small coverage of fields such as Thermodynamics or Engineering Mechanics in the Electrical Supply-programmes which are said to be significantly more visible in related programmes of the "Heat Sectors"-Department. (Unfortunately, the number and names of the study programmes offered by the Power Engineering School differ considerably in the documents.)

Thus, it can be stated that the study programmes generally reflect the learning objectives detailed and more precisely described in the audit discussions. As to the "Engineering Analysis" competences, the curricula may not cover all aspects of the Power Engineering discipline at a comparable level (as has been argued with regard to the load-flow-calculation, for instance), but they still meet the requirements. Concerning the "Engineering Design" field, some modules may be considered as initial steps to this end, however – not least due to the conceptual approach of the study programmes under consideration –, the depth of the design competences of graduates appear to be rather confined. There is barely any project or study work which can be assumed to convey design competences to a substantial extent. Also, the laboratory experiments are hardly "functional" in terms of encouraging students to independently find new engineering solutions.

In summary, the curricula of the programmes under consideration are consistently conceptualized along the organizational lines of the Power Engineering School. But eventually, this approach may have resulted in the development of study programmes inherently biased to compartmentalizing the power engineering discipline, thus barely leading students to a comprehensive understanding and methodical mastering of the *integrated* power engineering system and its related components. By the same token, the curricula of the said programmes contribute to a solid education in Natural Sciences and engineer-

ing fundamentals. However, the first study period of the Bachelor's programme (up to the third semester) also comprises a range of (mandatory or elective) modules/courses designed as so-called "Higher Education General Courses" which are substantially non-technical. Admittedly, the curriculum thus far is very much regulated by the Ministry. This notwithstanding, it might be useful to consider a reduction of the number of non-technical Higher Education General Courses with respect to the defined learning objectives in the engineering field and, thereby, to further developing the curriculum in the sense indicated above.

Regarding the description of the appropriate module content, it has been found that some module descriptions (as, for instance the Physics-modules in the Bachelor's programme) list a wide range of topics which are far too encompassing to really successfully be imparted in only one semesters time. The module descriptions need to be adapted thus far.

Assessment of the peers:

For the award of the ASIIN seal

Criterion 2.6 Curriculum/content

All in all, the peers considered the above said criterion as already being met by the curricula of the said programmes. Considering the disciplinary approach of the programmes, discussed above in detail, they strongly recommended in the long run to conclusively combine or conceptually adjust the different programmes dealing with power engineering in order to implement a more comprehensive grasp of all aspects of electrical power supply (including energy efficiency and environmental protection). Furthermore, in regard to the number and content of the Higher Education General Courses, the peers suggested considering a reduction of *non-technical* general knowledge modules in favour of fostering students' technical and engineering skills and competences. In this respect, the peers deemed it particularly commendable to strengthen the "Engineering Design" competences of graduates within the mandatory part of both degree programmes.The peers also found it necessary to check the module descriptions with a view to the specification of their actual content.

Eventually, the peers request the HEI to provide for a complete list of the study programmes offered by the School of Power Engineering.

For the award of the EUR-ACE® Label:

Although generally reflecting the EUR-ACE related engineering-specific competences in the fields of „Knowledge and Understanding", "Engineering Analysis", „Investigations",

„Engineering Practice“ und „Transferable Skills“, the peers deemed the curricular content of both study programmes less suitable to achieve the said learning outcomes in the “Engineering Design” field specifically (for further assessment see the previous section).

B-3 Degree programme: structures, methods and implementation

B-3-1 Structure and modularity

The modules („courses“) have the following size:

- On average, 2 to 3 Mongolian credit hours are allocated to each course/module (to be multiplied by roughly 1.6 to 1.7 in the ECTS).
- The Bachelor’s diploma work project is calculated with 5 Mongolian credit hours; 6 Mongolian credit hours are allocated to the master’s degree research work.
- According to SAR, all modules in the Bachelor’s and the Master’s programme differ in terms of content and qualification level. In case of identical or affiliate issues the Bachelor and Master modules are designed to be consecutive.
- Throughout, the duration of courses/modules doesn’t exceed one semester.
- Bachelor’s programme: two industrial placements with altogether 3 credit hours in total (1 + 2 credit hours).

International exchange of students is facilitated by the HEIs efforts to foster student exchange with HEIs abroad through cooperation agreements as, for instance, a joint Bachelor’s programme Electric Supply with a northern Chinese university concluded just recently.

Analysis of the peers:

Overall, the ASIIN-criteria for modularization are met. That is to say that the modules/courses in substance and content can, generally, be considered as constituting coherent and consistent components of teaching and learning. That way, each module usually consists of different didactic elements, such as theoretical lectures, exercises and/or practical elements in subject related laboratories. This applies with some reservation to a number of modules in both study programmes which carry a relatively low credit load of 1 or 2 credit hours. With a view to that, it might be worth considering to enlarge or, if

reasonably possible, to integrate such modules in order to enhance the conceptual consistency and, thereby, the achievement of the intended learning outcomes.

Because of the cross-programme application of many modules (as to the modules Methodology of Research Work I and II), and the principally non-consecutive character of the modules, it is possible to commence the Master's programme in the winter as well as in the spring semester (when admission takes place) without loss of time.

The curriculum of the Bachelor's as well as of the Master's programme consists of elective modules encouraging students to integrate some focal points into their study course. The opportunity of choosing essentially identical modules/courses in different study programmes of the Power Engineering School depending on time preferences or personal preferences regarding the responsible person might also contribute to the successful achievement of learning outcomes in due time.

It is noticed that the HEI undertakes significant efforts to broaden and intensify its international ties, and, regarding that, the exchange of both students and teaching staff particularly. Nevertheless, the SAR and the audit discussions leave the impression that in this respect much remains to be done, especially concerning students' mobility.

Assessment of the peers:

For the award of the ASIIN seal

Criterion 3.1 Structure and modularity

The peers considered the above said criterion to be fulfilled already. Still, the recommend considering whether small modules/courses (1 or 2 credit hours) could be enlarged or, wherever applicable, integrated in order to support the achievement of the intended learning outcomes. With a view to internationalisation, they also find it commendable to strengthen already existing efforts to enhance English language skills and to offer English-medium courses in the curriculum. In that respect cooperation with other HEIs, in particular HEIs abroad, should be further developed from their point of view.

B-3-2 Workload and credit points

According to the institution, 1 Mongolian credit hour equates to 48 – 60 hours of student workload (equalling 25 to 30 hours in the ECTS). In fact, as derives from the SAR and the module descriptions, one 1 Mongolian credit hour is generally calculated with 48 hours of student workload (altogether comprising teaching time and self study time). If a course/module has 1 credit hour, the workload of student consists of 16 hours of lecture

+ 32 hours of self-study, or of 32 hours of seminar + 16 hours of self-study, or of 32 hours of laboratory + 16 hours of self-study. 1 hour of training equals 45 minutes. 1 Mongolian credit hour is roughly equating 1.6 to 1.7 ECTS credit points.

In the Bachelor's programme, students have to collect 13 to 19 Mongolian credit hours per semester (equivalent to some 22 to 32 ECTS credit points), 17 credit hours on average, 135 in total. In the Master's programme students' workload ranges between 8 and 12 credit hours, 10 credit hours on average, totaling to 37 for the Master's programme respectively 172 for the combined Bachelor's and Master's programmes.

Generally, students are advised to select courses/modules totaling 17 to 21 credit hours student workload on average per semester. (Otherwise, depending on students' choice of the courses and the GPA of each student, the average workload per semester might differ from that number, so that, as a result, the duration of study at MUST may also vary.) According to the SAR, the school controls the semester load of a student. Taking less than 8 or more than 22 credits per semester needs to be officially permitted.

Credits for practical placements in the Bachelor's programme Electrical Supply are awarded as follows:

- *Industrial internship I*: Writing, presentation and defense of an introductory practice work report, and passing an exam on technical safety operation rules;
- *Industrial internship II*: Writing, presentation and defense of a work practice report;
- The time schedule of the introductory practice must take into account the characteristics of the appropriate power plant.

Analysis of the peers:

The HEI has implemented a credit point system that to a certain extent differs from the ECTS (European Credit Transfer System), though not principally. Most obviously, the ECTS and the Mongolian system of credit hours, allotted to the modules/courses, have in common the basic idea of referring to the student workload as the principal calculation unit. The difference then is confined to a concrete conversion factor. Accordingly, as stated above, 1 Mongolian credit hour is roughly equating 1.6 to 1.7 ECTS credit points. Referring to this relation of Mongolian credit hour and ECTS, it can be concluded that, roughly speaking, the student workload per semester on average doesn't exceed 32 ECTS, totaling up to 29 ECTS on average in the Bachelor's programme and 17 ECTS in the Master's programme. Considering the Master's programme, it has to be taken into account that it is, in fact, a part time programme designed for students who are already employed

aiming at complementing their field specific qualification. Unfortunately, the conversion table provided in the SAR (p. 39) is not at all that clear regarding the conversion and the summing up of Mongolian credit hours in comparison with the ECTS. Yet, the conclusion to be drawn from the detailed workload calculation in the module descriptions confirms the findings just put forward. For external stakeholders, of course, the credit hours system in use isn't per se comprehensible.

When asked about the reference point for calculating the workload of an individual module, using as an example the identical amount of credit hours for a Mathematics-module and an Ethics-module, the HEIs explanation in essence invoked some requirements of the Ministry. Apparently, a reliable calculation of the student workload through appropriate monitoring tools has not been carried through or even foreseen thus far.

Assessment of the peers:

For the award of the ASIIN seal

Criterion 3.2 Workload and credit points

The peers deemed the above mentioned criterion not yet fulfilled sufficiently. Regarding the credit point system in use, they considered it necessary that it is made transparent and comprehensible to relevant external stakeholders by reference to the European ECTS, in the first place in the Diploma Supplement (see below chapter B-7-2). As to the allocation of credit hours or ECTS respectively, the peers deemed it indispensible to confirm the awarded credit hours or ECTS through appropriate monitoring tools on a regular basis.

B-3-3 Educational methods

According to the SAR, the following educational methods are in use:

- Lecture, exercise, laboratory work, seminar, project work, and graduation/research work.
- Laboratory work, seminar, project work, and graduation/research work are methods of teaching/learning designed to steadily extend the room for students' self study on subject-related engineering problems.
- Lecture, seminar and laboratory hours are taught in classroom settings and two hours of the self-study hours must be spent in the classroom, where students can discuss their course work and receive advice from the advisory faculty member assigned to the student.

- Master's programme: Availability of selected online courses (TD703, TD704, TD708, TD709).

Options for elective modules are available:

- Regular elective courses/modules are foreseen in the Bachelor's respectively Master's programme study schedule;
- Students are also given the opportunity to choose courses/modules fitting with their study plan at different schools of MUST, thus providing for a greater flexibility concerning time planning and in selecting the lecturers;
- Accordingly, there are two stages of formal course/module respectively teacher election. That way, the individual study plan of all students for each semester, which has to be consented by a responsible adviser of the teaching staff each time, puts into place the foundations for the Schools' of Power Engineering semester schedule.

Analysis of the peers:

Overall, the teaching methods used for implementing the didactical concept seem to be appropriate to support the attainment of the learning objectives. It could be learned from the comments of the lecturers that the application of simulation-tools like MatLab or SimuLink normally isn't taught in technical modules but rather in accompanying laboratory courses. Also, lecturers referred to the example of MatLab in order to demonstrate how distance learning courses are carried through. Reportedly, the importance of elements of distance learning / e-learning in the study programmes of the Power of Engineering School is ever growing, in particular in the Master's programme that, after all, is designed to be extra-occupational in the first place.

In general, a fair ratio of contact hours to self study seems to be implemented in the study programmes, thus contributing to the achievement of the defined objectives. However, it should be noticed that this judgement is of limited validity only, as long as reliable monitoring instruments aren't in use confirming current workload-related credit hours (as to that see the previous chapter).

Assessment of the peers:

For the award of the ASIIN seal

Criterion 3.3 educational methods

The peers came to the conclusion that the needs of this criterion are adequately met. They appreciated the small learning groups, the HEI generally aims at, as eminently supportive with respect to achieving the respective learning outcomes.

B-3-4 Support and advice

Offers for support and counselling of students are provided as described below:

- Advising teacher: main official contact person for students providing guidance and advisory service in all study-related issues (study plan; choice of electives etc.);
- Academic Office for the particular programme respectively for the School of Power Engineering: members serve as mentoring and counseling consultants as well;
- Contact and office hours of teaching staff;
- Students supporting students as some kind of a tutorial/mentoring system, in which students are given an opportunity to collaborate with especially high performing (older) fellow students, thus capitalizing from their experiences;
- Health center and health advise;
- Student Union: Students of the School of Power Engineering belong to the MUST student union and are entitled to the rights and responsibilities for student board election procedures;
- Implementation of the electronic administration system “unimis” to support students’ study activities.

Analysis of the peers:

It has been observed that sufficient resources are available to ensure support and counselling for students. Upon inquiry, students confirmed that they are not only well advised in all questions relating to the study plan, conditions of study and exams, but also supported in choosing the required elective modules/courses in order to provide for a meaningful broadening or deepening of competences. In this respect, they stressed the cooperative action of so-called “Advising teachers” which is in their view particularly helpful for freshman.

According to SAR assessment procedure of advising teacher still needs to be improved in the sense of being more effectively implemented.

Assessment of the peers:

For the award of the ASIIN seal

Criterion 3.4 Support and advice

The peers found the said criterion to be fully met by the counselling concept of the HEI. They particularly emphasized the supportive role of the implemented mentoring system, the good student-teacher relations and the open-door policy of the School of Power Engineering as well as the said electronic administration system.

B-4 Examinations: system, concept and organisation

According to the self-assessment report and the information gathered during the discussions, the **exam methods** described subsequently are foreseen:

- Two term tests on each subject, in 8th and 13th weeks of the semester; the continuous evaluation of each course/module during the semester counts up to 70 points by the teacher, while the final semester exam incurs up to 30 points. The total score which is up to 100 points will count as final evaluation of the student. Students may take up to 3 exams per semester in certain subjects, thereby directly acquiring the related credit hours (multiplied with 3.33 in order to reach the 100 points of a full assessment).
- The normal form of the semester's exam is a full test; duration of the exam is around two hours. The full exam includes three parts: Comprehension (counting for 20%), Basic Knowledge (Counting for 50%) and Problem-Solving (counting for 30%).
- Results will be notified on the morning of the next day, the total score being reported at the Office of Academic/Training Affairs of each school for each student. In the afternoon of that very day, the exam commission will decide on disputable issues.
- The Office of Academic Affairs checks the final scores of each student (up to 70 points by lecturer, up to 30 points through exams), and registers the GPA of each student in the database.
- In case exam results are found to be not satisfying, students can apply to the office of academic affairs on this matter; their evaluation might be changed in the course to an "R"- or "E"-rating, meaning that the applicant decides to retake the course/module ("R") *or* that the respective exam is just missing ("E") forcing the applicant to re-study the course/module. The student is obliged to pass the exams with a grade A (96 to 100 points) to F (0 to 60 points).

- Graduation resp. Research Work (final thesis) is accompanied by an oral defense, in the Bachelor's and in the Master's programme as well. There is always an option for an external thesis; in fact, at least in the Master's programme, external final theses appear to be the normal case.
- Examination form and procedure is described in detail in the respective course/module description.

The **organization of exams** is managed as follows:

- Information of date, conditions and content of exam tests is given at the beginning of semester, primarily in the "Students' handbook". The admissions office announces the date, classroom and teachers in charge of conducting the tests.
- In particular, major and specialization subjects are foreseen to be tested orally.
- Tests are taken within two weeks after passing 16 weeks of course teaching.
- In Graduation resp. Research works the examiner's assessment counts 50 points at a maximum; criteria for the assessment have to be defined in advance.
- Examination boards are set up on state level comprising representatives from the HEI and the industry as well.
- According to the appropriate regulations, two consultant teachers are to be appointed for each bachelor graduation work; the bachelor graduation work may also be assessed by an external reviewer, if necessary.

Analysis of the peers:

Obviously, form, number and organizational procedures of assessment are densely regulated. Through the combination of two term-tests and one final examination the HEI adopts an approach that intensively monitors student achievements. In fact, the term tests during the semester impose an additional workload on the teachers. On the other hand, students get a helpful feedback telling them about their actual state of knowledge, and, by doing so, facilitating their preparation for the final exams. This approach might be qualified as competence-oriented, if the tests weren't altogether carried through as written tests, in many cases, moreover, as multiple choice-tests. Assuming that examinations in the first instance should figure as a measure of the extent to which the intended learning outcomes have been individually achieved, it seems doubtful that learning outcomes of all kind could be equally measured by essentially the same examination method. Therefore, a greater variety of the methods of examination taking into account the intended learning outcomes of the individual module/course might reflect more convincingly the competence-orientation of the examination method in general.

Otherwise, students confirmed that they indeed consider the term tests as meaningful preparations for the final exams. Correspondingly, they didn't find the number of exams (seven final exams on average, at a maximum) overstraining.

At first glance, as has been indicated already, the rules for examinations and advancement appear to be rather complicated. However, both students and lecturers seemed to have a comprehensive grasp of the regulations. This appraisal encompasses the procedural conditions for the repetition of exams as well. The regulations also seem to be transparent to students as far as grading criteria are concerned. To summarize, students considered the organisation of examinations as appropriate and responsive to their needs.

As to the graduation or research work respectively, it has been already stated that module descriptions need to be produced (see above chapter B-2-3).

Assessment of the peers:

For the award of the ASIIN seal

Criterion 4 Examinations: system, concept and organization

The peers considered the above said criterion as mostly fulfilled. Yet, they urged module descriptions for the graduation or research works to be added. Also with respect to the examination system they deemed it desirable to revise the almost entirely test-based examination methods so as to more consistently reflect the intended learning outcomes of the individual modules.

B-5 Resources

B-5-1 Staff involved

According to the HEI, the teaching staff is composed of 1 leading professor, 1 advising professor, 3 professors, 1 associate professor, 5 senior teachers, 2 teachers and 2 intern teachers. By degree, 7 teachers graduated with a Ph.D., 8 with a Master degree. The School of Power Engineering apparently also recruits retired professors or teachers in an effort to strengthen its expertise and teaching capacity. At this time there are eighteen retired professors or teachers engaged in supporting the teaching staff of the programmes under consideration.

The HEI states that there are close research links of professors and lecturers of the Electrical Supply programmes with the National Renewable Energy Center, Power Plant No 4,

National Transmission Grid and National Dispatching Center. The SAR lists research fields of the professors engaged in the said programmes as follows:

- Electrical machines, electrical transfer, power electronics, converting technology, energy efficiency;
- Theory of electrical technique;
- High voltage technique, high voltage testing, adjustment, thunder protection and grounding, electrical material;
- Electrical networks, electrical substations;
- Generation and distribution of electrical energy, urban electricity supply and diesel station.

Analysis of the peers:

The composition and qualification of the staff seems to be altogether adequate in order to facilitate the achievement of the objectives of the degree programmes. The Power of Engineering School's efforts and measures to continuously further develop the didactical and professional competences of its teaching staff is especially worthwhile in this respect. Still, the research basis and output of the School in such research fields related to the said study programmes leave considerable room for improvement. Thus, it appears that the present research work is dominated by writing lecture material rather than basic/ applied research work. The latter, in turn, depends to a great extend on the HEI's and School's success in broadening its research cooperation with universities, research institutes and companies on an international scale. Both, fostering the research basis and, by doing that, contributing to the professional expertise of the teaching staff will be of the utmost importance for the further development of the Master's programme specifically.

According to the SAR, the apparently high work load of some of the lecturers in the Bachelor's and Master's programme is due to the fact that some 150 Bachelor students of the School of Civil Engineering and Architecture have been assigned to the School of Power Engineering at short notice in the study year 2010/11. It is assumed that the additional workload will continue to burden the teaching staff until the year 2014, but with the prospect to decrease in the following years to the base level. Additionally, following the SAR, the department has recruited already two main staff teachers and some part time teachers (by agreement) in order to solve the transitional shortcomings in teaching capacity.

Assessment of the peers:

For the award of the ASIIN seal

Criterion 5.1 Staff involved

The peers considered the above mentioned criterion as being met already. Nevertheless, with a view to the future prospects of the Power Engineering School as well as its study programmes, and in particular its Master's programmes, they regarded it highly commendable that measures should be taken to generally improve the research capacity of the School and its Teaching staff respectively.

B-5-2 Staff development

The institution reported on the following measures to subject-related and didactical further training for staff:

- According to the SAR, teachers of the School of Power Engineering are encouraged to attend internal as well as international training courses to further develop their didactical and professional competences. This encompasses encouragement and support to work out and publish scientific papers in international visible publications, thus proving the quality of the Schools' research activities.
- Newly appointed teachers participate in a 3 weeks short training programme and get a certificate.
- According to SAR, in 2010 to 2012, "Electrical distribution and High voltage" professors' team teachers attended 78 training programmes, with a total of 9 teachers participating in four different training programmes abroad.
- Reportedly, at least four teachers also attended English language courses.
- The SAR also reports on mentoring new teaching staff by experienced teachers as a path to supporting the career development.

Analysis of the peers:

The SAR indicates a clear awareness of the necessity of teaching staff to keep up with state-of-the-art knowledge in the appropriate subject areas as well as in the didactical skills field. In this regard, the SAR and comments of the HEI during the audit talks documented manifold measures and efforts to increase the professional and didactical expertise of the teaching staff and also to give incentives to consciously confront the topic.

Assessment of the peers:

For the award of the ASIIN seal

Criterion 5.2 Staff development

The peers considered the requirements of the said criterion as already met by the human resources policy of the HEI.

B-5-3 Institutional environment, financial and physical resources

According to the SAR, MUST by now has grown into a higher education institution with 7 schools, e-schools, two polytechnic colleges, one TVET, three institutes, 51 centers, 95 professor's teams, 21 departments, 6 professional teams and seven technical education centers, 1330 lecturers, 1019 employers and three high schools. With regard to the Mongolian energy sector, it is characterized as the main research and academics center.

As to the study programmes under consideration, the School of Power Engineering takes responsibility. The school's main focus in teaching and research lies within the fields of energy, heat, automation, energy management, industrial ecology and renewable energy, but also at educating in subject areas like using hospital equipment, cooling technology, conditioning systems, electronics and computer technology used in engineering sectors.

Currently, the School of Power Engineering consists of seven professor's teams: "Institute of Heat technique and Industrial Ecology", "Research Center of Renewable Energy and High Voltage Experiment", "Industrial Process Automation Center", "Energy Saving Center", "Modern Technique and Technology of Heat", "Furnace Experiment and Research Center" and "Education Training Centers of Cooling Technology Research".

The financial infrastructure and physical infrastructure is described in the SAR at length. This holds especially for the laboratory equipment of the School.

According to the SAR, the faculty has concluded cooperation agreements with:

- Northeastern University of Shenyang in the framework of a joint degree programme;
- Czech Technical University;
- Universities of Switzerland, Greece, Belgium and Russia within the framework of student and teacher exchange programmes;
- On a regional and national scale: many industrial companies in the energy sector. The SAR underlines that the Power Engineering School closely cooperates with or-

ganizations, industries and companies in the energy sector in order to improve the ties between teaching, research and industry, thus increasing the capabilities of the Faculty and fostering the School's physical resources. Also, by a mutual agreement of the Minister of Infrastructure and the Minister of Education, the Power Engineering School uses Thermal Power Plant-4, Thermal Power Plant 3, the Heating Network System, and the Electricity Distribution and Transmission companies as the school's practical knowledge laboratories and sites.

Internal cooperative arrangements do exist in the framework of conducting the study degree programmes of the School of Power Engineering, *inter alia* in the form of modules/courses offered throughout the programmes.

Analysis of the peers:

According to the programme coordinators, the Electrical Supply study programmes are of central relevance for the HEI in the light of the undisputed importance of the electrical power supply for the raw materials sector and other parts of the Mongolian infrastructure. With respect to this, the international accreditation itself is understood as part of the internationalization strategy of the HEI, aimed at raising the level of education to internationals standards and thereby improving the conditions for international cooperation which, in turn, is considered to affect teaching and research at MUST. The internal cooperative arrangements of the Power of Engineering School, on the other hand, reflect its organisational structure – as has been stated already (see above chapter B-2-2, B-2-6). This structure indirectly renders a variety of study programmes dealing with the diverse aspects of electric power engineering in different depth, thus omitting to a certain extent a comprehensive view on the issue (see further above chapter B-2-6).

During the on-site visit, the peers visited a variety of labs and other sites of the HEI's infrastructure. Overall, it has been found that the given resources, particularly the labs, are adequate, thus facilitating the achievement of the objectives of the degree programmes.

It has been stated already that the efforts of the HEI to increase its ties to other universities, thereby strengthening its international connections, student and teacher exchange by now seem to be one-directionally biased with primarily foreign students and teachers studying and giving lectures in Mongolia (see above chapter B-3-1).

Assessment of the peers:

For the award of the ASIIN seal

Criterion 5.3 Institutional environment, financial and physical resources

The peers concluded that the criterion related to the resources of the said study programmes has been met adequately. In particular, they saw the good infrastructure and the lab equipment as fitting the demands of the study programmes under consideration. Apart from this, the peers made some reservations concerning the international cooperation in teaching and learning as well as the diversification of electric power supply-related study programmes addressed at several times in this report.

B-6 Quality Management: further development of degree programmes

B-6-1 Quality assurance and further development

Considering the quality assurance concept of MUST and the School of Engineering in particular, the SAR notes measures and instruments as follows:

- MUST has successfully undergone an accreditation procedure of the Mongolian National Council for Education Accreditation (MNCEA), confirming that it overall fits the "Criteria and standards of Higher Education Organizations to perform self-evaluation on their internal activities", and thus has been accredited by MNCEA. Both, MUST and the School of Power Engineering, fulfil the quality standards set by MNCEA.
- Establishment of the Department of Administration and Monitoring Assessment and the Department of Training Policy and Coordination which, generally speaking, are responsible for the quality assurance in the said programmes.
- Implementation of two programmes to improve the quality of training, initiated by the Department of Training policy and Coordination: firstly, the programme "Training quality campaign" with a planned duration of three years, with a main focus on improving the electronic information system MUST – UNIMIS (with regard to the assessment of the quality of teaching); secondly, the programme "Century student of MUST-1" with a duration of three years as well, and three capstone projects: a) developing an integrated calendar of student training activities, b) renovation of regulations and codes related to the students, and c) organizing the course of lectures on "Student of 21st Century". [Unfortunately, though accessible on the website of the HEI, the results of these projects couldn't be included in the assessment, because they are presented in Mongolian language only.]

- Appointment of a training quality assurance manager of the School of Power Engineering at MUST who is in charge for the school's quality assurance strategy, instruments and procedures. According to SAR, the training quality assurance manager takes responsibility for conducting the survey on students' overall satisfaction with the study course, for analyzing the results, identifying the factors which have an impact on the quality of training, and carrying through measures derived directly from the results of the survey in order to improve the training quality. The SAR also notes some of measures taken in consequence of these results.
- It also rests with the training quality manager to assess each student's individual achievements with regard to the intended learning outcomes on the module level as reflected in the GPA.
- Following the SAR, the School of Power Engineering also regularly conducts a survey of graduates of the Electrical Supply programmes.
- According to SAR, both graduates and employers seem to be participating in the monitoring activities of the School of Power Engineering, thus ensuring that their perspective on the programmes under consideration is taken into account in the quality assurance strategy of the HEI.

Analysis of the peers:

The HEI has presented a concept of quality assurance involving institutional arrangements such as the establishment of a "Department of Administration and Monitoring Assessment", a student council or the participation of representatives in the state-run examination boards as well as instruments like surveys of students, graduates or employers. It also has initiated diverse projects to further develop its quality assurance strategy, the improvement of the electronic data management system and its utilization for the quality assurance issues being just one of them. And it is without doubt that some of those arrangements and instruments are working quite effectively in the sense that they reasonably contribute to achieving the study programmes' overall quality goals. Thus, for instance the meeting with representatives of the energy sector led to the strong impression that their participation in the development of the study programmes can be considered effectively implemented.

On the other hand, there are such crucial elements like student/graduate surveys, whose real impact in regard to quality assurance could hardly be seen or even proved (neither from the indications in the SAR, nor from the talks during the onsite visit). The student council representing the student voice vis-à-vis the administration of the HEI and the more informal contacts between students and lecturers aiming at improving any short-

comings notwithstanding, the discussion with students in particular doesn't give any meaningful clue to the way of how the results of surveys and related key student data are really made use of in the quality assurance processes. This has been stated in a former chapter of this report with respect to the basis of the workload calculation, but may also be related to issues like module content or the definition of skills and competences.

Assessment of the peers:

For the award of the ASIIN seal

Criterion 6.1 Quality assurance and further development

The peers acknowledged the efforts of the HEI and the School of Power Engineering to effectively install elements and procedures of quality assurance. However, they concluded that the requirements of the above mentioned criterion have not been fully met so far.

With respect to the effective use of instruments and data gathered, the peers considered further improvements to be necessary. From their point of view, the concept of quality assurance needs to transparently implement feedback loops specifically between the HEI on the one hand and students / graduates on the other regarding the content of courses, the workload calculation, the awarding of credit points as well as the definition of skills and competences addressed in the programme objectives. The peers assumed this to be indispensible, if programme coordinators shall be enabled to recognize and adequately correct deficits in the study programmes.

B-6-2 Instruments, methods & data

In order to illustrate the use that is being made of the above mentioned methods and instruments of quality assurance in teaching and learning, the HEI presents the following data:

- Table of GPA for the Bachelor's programme Electrical Supply comprising the study years 2009/10 to 2011/12;
- Comparative data of GPA achievements in the diverse Bachelor's study programmes of the School of Power Engineering ranging from the study year 2009/10 to 2011/12
- Comparative data of GPA achievements in the diverse Master's study programmes of the School of Power Engineering for the study years 2009/10 to 2011/12;

- Number of graduates in the Bachelor's and the Master's programme in 2011;
- Employment rates and information on professional fields of employment of graduates spanning the academic years 2009 to 2012.

Analysis of the peers:

Statistical data of GPA achievements in the Bachelor's programme Electrical Supply show that, starting from the study year 2010/11, average GPA of students keep dropping below the threshold level of 2.0. According to the programme coordinators this result is mainly due to the fact (already mentioned in an chapter) that Construction College students started studying in the Electrical Supply programmes that very study year, and, additionally, to some structural bifurcation in the programme occurring at that time. However, as programme coordinators pointed out, the average GPA in the programme is gradually getting close to MUST average GPA presently (2.02).

The data provided widely confirm what has been analyzed and concluded in the previous chapter. Relevant survey data (which, after all, should be available for study programmes running for about ten years already) aren't referred to or summarized in such a way that its utilization for purposes of quality assurance is rendered visible. And even the mass of GPA accounts (apart from their occasional inconsistency) doesn't provide any idea of how it is used concretely in improving the quality of the study programmes. Curriculum modifications or certain organizational measures derived from the GPA findings might have proved exactly such utilization for the quality development of the study programmes. That isn't to say there aren't any conclusions or measures of the HEI capable of matching these requirements. However, they couldn't be clearly identified so far.

Assessment of the peers:

For the award of the ASIIN seal

Criterion 6.2 Instruments, methods & data

Because of the reservations argued in chapter B-6-1, the peers deemed the criterion regarding the quality assurance instruments, methods and data, and their utilization in further developing the quality of the said study programmes as not yet fulfilled.

B-7 Documentation and transparency

B-7-1 Relevant regulations

The regulations mentioned below have been provided for assessment or referred to in the SAR (*all of them put into force*):

- Mongolian education law (approved by Mongolian Great Khural on May 3d, 2002)
- Mongolian law on Higher Education (approved by Mongolian Great Khural on May 3d, 2002)
- Procedure of Mongolian University of Science & Technology
- Entrance Procedure of Mongolian University of Science & Technology (approved by meeting of President's council, February 01st, 2011
- Diploma Project for Bachelor's Degree & Defending Procedure (approved by meeting of the President's council, December 29th, 2006
- Master's and Doctorate Training in MUST, Procedure for Defending Degree (Annex of order A-63 by Rector of Must, in 2011
- Rule of Governing Board of Mongolian University of Science and Technology (First annex to Resolution 10/06 of Governing Board, July 8th, 2010
- Rule of Mongolian University of Science and Technology (approved by meeting of Governing Board of MUST, January 23rd, 2008
- Rule for Appraisal of Student Knowledge
- Rule for Issuing of a Higher Education Diploma
- Student's Lesson Selecting Rules
- Procedure to Calculate Performance Credit of Professors and Teachers (approved by meeting of President's commission of Mongolian University of Science and Technology, June 2nd, 2008
- Mongolian University of Science and Technology President's Decree, A-93, May 24th, 2012
- Mongolian University of Science and Technology President's Decree, A-97, May 28th, 2012

Analysis of the peers:

Regulations for all study-programmes are in place, in force and (in the Mongolian version) made available for consultation. They encompass all stipulations indispensible for the admission and the operation of the programmes as well as the graduation.

The most important study and examination rules are found to be highly incremental encompassing a long list of national laws, university statutes and bye-laws, procedures and guidelines, and presidential decrees. However, as has been said with respect to the ex-

amination rules applying to students of MUST, students apparently don't complain about this legal situation, and seem not only to be used to it, but also considered the rules to be sufficiently transparent and comprehendible to them.

It has been found that in some cases the dates of validation and titles of regulations registered in the SAR do not fully match the corresponding annexes. As to the titles, this finding supposedly results from simple translation errors. Otherwise, the annexed laws, orders, procedures and guidelines are taken as appropriate and valid.

Assessment of the peers:

For the award of the ASIIN seal

Criterion 7.1 Relevant regulations

The peers judged the above mentioned criterion to be fulfilled.

B-7-2 Diploma Supplement and qualification certificate

There are no samples of programme specific Diploma Supplements in English language annexed to the self-assessment report.

As of now, there is also no statistical data informing about the grading within the relevant cohort according to the ECTS Users' Guide, in addition to the national grade. Such information could help external stakeholders to assess the overall study achievements of the graduate reflected in the national grade.

Analysis of the peers:

No English language Diploma supplements for the respective degree programmes have been issued so far. These should provide information about the study aims programme-specific learning objectives, the nature, level, context, content and status of the studies, the success of the graduate as well as about the composition of the final grade (examples could be found on the website of the European Commission).

As possible stakeholders like other universities or employers are mainly interested in more specified information about the study programme the graduate has completed and the qualification profile he has acquired thereby, it, of course, would be most important that the results of the revision of the learning objectives (see above chapter B-2-2) are included appropriately.

Assessment of the peers:

For the award of the ASIIN seal

Criterion 7.2 Diploma Supplement and qualification certificate

The peers deemed the above mentioned criterion not fulfilled already. They considered it necessary that programme-specific diploma supplements in English language have to be prepared and handed out to students on a regular basis – along with certificates and transcripts – providing information about the objectives, intended learning outcomes, structure and level of the degree, as well as about an individual's performance. Regarding the latter, it is, from their point of view, indispensible to transparently and comprehensibly introduce the Mongolian credit point system to external stakeholders, thereby referring to the European ECTS. According to the ASIIN General Criteria for the Accreditation of Degree Programmes, the Diploma Supplement must also indicate how the final mark was calculated (including weighting of marks) so that external stakeholders can clearly see how each component was incorporated into the final degree.

With respect to the learning objectives for the study programmes under consideration, the peers indicated that the revision which they considered necessary needs to be taken into account in the respective Diploma Supplement as well.

C Additional Information

Before preparing their final recommendation, the auditors ask that the following missing or unclear information be provided together with the comment of the Higher Education Institution on the previous chapters of this report:

1. Complete schedule of the study programmes offered by the School of Power Engineering of Mongolian University of Science and Technology

D Comment of the HEI (14.11.2013)

The institution provided the following statement:

№			Comment of the PES	
B. Report of the peers (Accreditation Report)				
1	B-1	Formal specifications	We are accepting the recommendation of the peers and the study program name will be re-named as "Electrical Power supply" as we discussed.	
B-2 Degree programme: Content, concept and implementation				
2	B-2-1	Objectives of the degree programme	Thank you for the Peer's	
3	B-2-2	Learning objectives of the programme	According to the peers considerations we will revise the learning outcomes and should be clearly outlined as ▪ Bachelor degree (4 years) ▪ Has knowledge and ability to work with stuff. Knows how it works, but does not know all theory ▪ Master degree (2 years) ▪ Has knowledge and ability to design For awarding EUR-ACE we planning to reconstruct the curriculums for Bachelor and Master Degree including some more subjects as „Engineering analysis", " Transferable skills" and "Engineering Design"	
4	B-2-3	Learning outcomes of the modules/module objectives	HEI will update module name, program name, " Module handbook" and : Objective matrix " in English with good wording as in original Mongolian language following the peers recommendations.	
5	B-2-4	Job market perspectives and practical	Thank you for the Peer's	

		relevance	
6	B-2-5	Admissions and entry requirements	HEI is agree to more consideration on the mobility of students from the view of internationalization according to Lisbon Convention.
7	B-2-6	Curriculum/ Content	1. For awarding EUR-ACE we planning to reconstruct the curriculums for Bachelor and Master Degree including some more subjects as „Engineering analysis", " Transferable skills" and "Engineering Design" 2. The module decriptions will be revised with the peers recommendations for reduction of non-technical higher education general courses.
B-3. Degree programme: structures, methods and implementation			
8	B-3-1	Structure and modularity	We are planning to expand the traditional cooperation with European universities (Germany, Austria and Czech republic) in the direction to enlarge English medium courses with the view of internationalization.
9	B-3-2	Workload and credit points	We are sending the schedules of Study programs on Bachelor and Master degrees for Electrical Power Supply transpared to ECTS as the attachments to ensure more understanding of student workloads.
10	B-3-3	Educational methods	Thank you for the Peer's
11	B-3-4	Support and advice	Thank you for the Peer's
B-4 Examinations: system, concept and organisation			
12	B-4	Examinations: system, concept and organisation	HEI will revise the almost entirely test-based examination methods.

B-5 Resources			
13	B-5-1	Staff involved	Thank you for the Peer‘s
14	B-5-2	Staff development	Thank you for the Peer‘s
15	B-5-3	Institutional environment, financial and physical resource	Thank you for the Peer‘s
B-6 Quality Management: further development of degree programmes			
16	B-6-1	Quality assurance and further development	We did not introduce the newly organized work results on installation quality assurance system at PES as the printed 3 brochures consists of : students questionnaires on the learning satisfaction, teachers workload distribution and information on PES’s teacher and student statistics . To ensure the feedback loops we had been organized the following activities for the years of 2009-2012. ▪ Students fill questionnaire about all courses they have this semester ▪ Was the lecture good prepared ▪ Were the materials of the lecture relevant ▪ Was the content of the lecture clearly explained, etc. ▪ Same questions for laboratories and seminars ▪ School’s and learning environment ▪ Results are analyzed by head of the department ▪ He is responsible for the courses and teacher of his department

			▪ He writes his own commentaries to the results and send them to dean ▪ Dean/vice dean for education then analyze the results from overall point of view
17	B-6-2	Instruments, methods & data	We are planning the certain organizational measures and curriculum modifications for quality assurance and for the development of study programs on Bachelor and Master Degrees on Electrical Power Supply.
B-7 Documentation and transparency			
18	B-7-1	Relevant regulations	Thank you for the Peer's
19	B-7-2	Diploma Supplement and qualification certificate	HEI is agree with the assessment of the peers that the criterion on English Language Diploma Supplement and Qualification certificate analyzed basing on SAR documents is not fulfilled already. Because of not good wording translation of ASIIN requirements 7.2 into Mongolian language, we have been missing this document in English prepared following the model. Only some of requirements of above model of Diploma Supplement in English (such as individuals information – name of degree holder, name of qualification, name of awarding institution, official length of program or study the individual's grades/credits and GPA) are already in the English language diploma attachment issued by MUST in SAR (Page 208- 222). But, our documents do not include most important parts of required Diploma Supplement as the description of Higher Education in Mongolia, Diagram of Higher Education Qualification Levels in Mongolia, objectives and intended learning outcomes, structure of degree programs, credit systems which can be transparently and comprehensibly introduced to international stakeholders equivalent to ECTS and Quality Assurance. We understood that the Diploma Supplement in English which should meet ASIIN requirements written in frame of the model. We will prepare this in the future and the English Language Diploma Supplement revised and officially approved by the Academic Board of MUST will be issued.

E Final Assessment of the peers (22.11.2013)

The **additional information** provided by the institution is found to be meaningful and complete.

The list of the study programmes strikingly confirms that much of the apparent shortcomings of the Electrical Supply-study programmes, regarding particularly a more comprehensive approach to power engineering (as discussed above, see chapter B-2-2 and B-2-6), is indeed owed to the organizational structure in PES. This applies for subject-related areas like power plants, renewable energy systems and environmental aspects of electrical power supply as well as for methodological fields of the discipline. The course plans of the different study programmes run by PES is revealing in that they clearly demonstrate that the PES commands the expertise and, moreover, the curricular means to further develop the curriculum of the Electrical Supply-study programmes in order to equip graduates with a more comprehensive grasp of the power engineering discipline.

Criteria 2.6, 5.3 (Curriculum, institutional arrangements, internal cooperation of departments in PES)

Following this argument, the peers confirm a recommendation specifically aimed at this objective (see below recommendation 1).

In its **statement**, the HEI demonstrates a generally constructive and willing attitude towards the peers' observations and partly critical assessments (for instance, in its comments on the name of the study programmes, the learning outcomes, on planned modifications in the curriculum in terms of strengthening students' competences in the fields of Engineering Analysis and Engineering Design, on developing a Diploma Supplement meeting the accreditation requirements, and also on measures planned or instruments already at hand in order to foster the quality assurance of the study programmes). However, since all of this can only be considered as a declaration of intent presently with nothing of it being implemented so far, it does not imply any changes of the respective assessments and conclusions of the peers.

Nevertheless, the peers would like to stress some points with respect to the learning outcomes of the programmes, the practical training parts of the Bachelor's programme, the

credit point system and its documentation of student workload, and the HEI's concept of quality assurance.

Criteria 2.2, 2.6 (Learning outcomes, curriculum)

The additionally provided learning outcomes for the Bachelor's and the Master's programme in the HEI's statement notwithstanding, the task of defining programme-specific learning outcomes in the sense of indicating more precisely the skills and competences graduates should have acquired after completing the programme ("qualification profile") needs still to be dealt with. Therefore, the respective requirement which has been preliminary drafted by the peers is fully confirmed (see below requirement 1).

The HEI's announcement to enlarge the students' competences in the field of Engineering Analysis and Engineering Design as well has been noticed. In fact, the implementation of curricular modifications is considered indispensible with regard to meeting the requirements of the Subject-Specific Criteria of the Technical Committee 02 – Electrical Engineering and Information Technology – and the correspondent requirements of the "EUR-ACE Framework Standards...". This is expressed in a requirement aimed at assuring this revision (see below requirement 4).

Criterion 2.4 (practical and profession-related relevance)

With a view to the competences of the Bachelor students in the field of engineering practice, the peers endorse their initial assessment that any provision aimed at strengthening those competences would be commendable. Whether this might be achieved through forming the practical training modules more diligently, or otherwise (for instance, through additional project works within the curriculum) should be up to the decision of the HEI (see below recommendation 7).

Criterion 3.2 (Workload and credit points)

In the framework of the additional information, the HEI also provides another schedule of the students' workload in the Bachelor's and the Master's programme. Unfortunately, the conversion of the Mongolian credit hours system into the ECTS system presented here is obviously at odds with the information gathered from the SAR and the talks during the onsite visit. According to the newly delivered schedule, the self study hours of students are significantly increased, amounting to a ratio of 1 Mongolian credit hour to roughly 2

ECTS credit points in the Bachelor's programme respectively 2 to 3 ECTS in the Master's programme (instead of 1.6 to 1.7 ECTS credit points as assumed so far, see above chapter B-3-2). Neither the conversion of the individual module's workload, nor that of the study programme as a whole seems comprehendible, if these conversion sheets are supposed to substitute for the information provided so far. And, what is more, they do not match the workload calculation given in the individual module descriptions. Therefore, it is not only considered necessary that the HEI explains the Mongolian credit hour system in terms of student workload (e.g. in comparison to the European Credit Point System). With a view to the Conversion sheets provided, it is also indispensible that the HEI consistently and comprehensibly indicates the average workload of students per module and per semester. The peers now deem an additional requirement aiming at this clarification compelling (see requirement 2).

Criteria 6.1, 6.2 (quality assurance, data and instruments)

The HEI's argument that it had already established some of the feedback loops the peers couldn't identify so far is commendable. Still, the measures which are either said to be put into effect already or planned to be applied soon aren't proven yet. Therefore, the previously formulated requirement addressing this is left unaltered (see below requirement 7).

Taking into account the additional information and the comments given by the HEI, the peers summarize their analysis and **final assessment** as follows:

For the award of the ASIIN seal:

With the above stated modifications, the peers confirmed their previous assessment and their recommendation for decision as well.

For the award of the EUR-ACE® Label:

The peers deemed that the intended learning outcomes of the degree programmes under review all in all (*but with reservations regarding the Engineering Design-competences*) do comply with the engineering specific part of Subject-Specific Criteria of the Technical Committee 02 – Electrical Engineering and Information Technology. Therefore, they do recommend the award of the EUR-ACE® label.

The peers recommend the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific labels	Maximum duration of accreditation
Ba Electrical Supply	With requirements for one year	EUR-ACE®	30.09.2019
Ma Electrical Supply	With requirements for one year	EUR-ACE®	30.09.2019

Proposed requirements and recommendations for the different seals:

For both degree programmes	ASIIN
1. The learning objectives for each study programme have to be defined programme-specific in the sense of indicating more precisely the skills and competences graduates should have acquired after completing the programme ("qualification profile"). Furthermore, it has to be plausibly demonstrated in an "objectives matrix" that these learning objectives are adequately reflected in the learning outcomes of the individual modules. The revised learning outcomes also need to be communicated and made accessible to students. They need to be regarded in the respective Diploma Supplement as well.	2.2, 7.2
2. The Mongolian system of credit hours and its conversion into any other credit point system must be consistent and comprehensible. Moreover, the credit hour system in use has to be made transparent and comprehensible to relevant external stakeholders (in the Diploma Supplement, for instance).	3.2
3. Programme-specific Diploma Supplements have to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes, structure and level of the degree, as well as about an individual's performance.	7.2,
4. It is necessary that the Engineering Design-competences of students shall be strengthened within the mandatory part of the curriculum.	2.6, 2.2
5. The module descriptions have to be revised and made accessible to the students and teachers alike according to the remarks given in the report (learn-	2.3, 2.2,

ing outcomes, module content, missing module descriptions (practical training and graduation works), frequency in which a module is offered, consistency of course/module names in English translation).	2.4, 2.6, 4
6. Rules for the recognition of activities completed externally have to be adopted, especially with a view to internationalization and, in particular, the mobility of students.	2.5
7. The concept of quality assurance needs to transparently implement feedback loops specifically between the HEI on the one hand and students / graduates on the other in regard to the content of modules, the workload calculation, the awarding of credit points as well as the definition of skills and competences that are addressed in the programme objectives. Thus, programme coordinators shall be enabled to recognise and adequately correct deficits in the programme.	6.1

Recommendations

For both degree programmes	**ASIIN**
1. It is strongly recommended, in the long run, to combine or conceptually integrate the different programmes dealing with power engineering in order to get a more comprehensive grasp of all parts of electrical power supply (including energy efficiency and environmental protection).	2.6, 5.3
2. It is recommended to reconsider the programme name with respect to its primary disciplinary subject ("*electrical power supply*").	1, 2.2
3. It is recommended to consider enlarging or, wherever applicable, integrating small modules/courses (1 or 2 credit hours) in order to support the achievement of the intended learning outcomes.	3.1
4. It is recommended that, with a view to internationalisation, already existing efforts to enhance English language skills and to offer English-medium courses in the curriculum should be strengthened. In that respect cooperation with other HEIs, in particular HEIs abroad, should be further developed.	3.1

5. It is recommended to revise the almost entirely test-based examination methods so as to more consistently reflect the intended learning outcomes of the individual modules.	4
6. It is recommended that measures should be taken to generally improve the research capacity of the School of Power Engineering.	5.1
For the <u>Bachelor's Degree programme</u>	
7. It is recommended to consider a more systematic preparation and prolonged duration of the industrial placement modules, or to otherwise strengthen the profession-oriented competences of students.	2.4

F Comments of the Technical Committee 02 - Electrical Engineering and Information Technology (19.11.2013)

The Technical Committee fully accords with the requirements and recommendations formulated by the peers. Discussing the procedure on the basis of a draft version of the peers' report in its session, it takes note of the peer's final assessment by way of the minutes of its meeting (circulation procedure).

For the award of the ASIIN seal:

The Technical Committee recommends awarding the ASIIN seal for the <u>Bachelor's</u> and the <u>Master's programme Electrical Supply</u>, thereby confirming the proposed requirements and recommendations *without any modification or addition*.

For the award of the EUR-ACE® Label:

The Technical Committee assumes from the peers' assessment that the intended learning outcomes of the <u>Electrical Supply-programmes</u> generally comply with the engineering-specific part of its Subject-Specific Criteria. However, as has been argued in the peers' report, Engineering Design-competences of graduates of both programmes are rather limited, and consequently subject to a major requirement (see above requirement 4).

However, because of the disciplinary and procedural interrelationship between the ASIIN seal and the EUR-ACE® label, the Technical Committee also recommends the award of the EUR-ACE® label, albeit with the above said reservation.

The Technical Committee 02 – Electrical Engineering and Information Technology recommends the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific labels	Maximum duration of accreditation
Ba Electrical Supply	With requirements for one year	EUR-ACE®	30.09.2019
Ma Electrical Supply	With requirements for one year	EUR-ACE®	30.09.2019

G Decision of the Accreditation Commission (06.12.2013)

The Accreditation Commission for Degree Programmes discusses the procedure. It fully agrees to the assessment of the peers and deems the proposed requirements and recommendations both adequate and accomplishable in nine months time. Concerning the future development of the said programmes at the Mongolian University of Science and Technology, the Accreditation Commission strongly supports the related recommendation 1 in order to encourage a curriculum design that more aptly encompasses all aspects of power engineering.

With a view to future accreditation procedures in the international field, it strongly suggests taking every measure to appoint a student from the country of the applicant HEI as a member of the peer group.

Decision about the award of the ASIIN seal:

The Accreditation Commission concurs with the assessment of the peers and the Technical Committee without modification or amendment.

Decision about the award of the EUR-ACE® Label:

The Accreditation Commission finds that the intended learning outcomes of the Electrical Supply-programmes generally comply with the engineering-specific parts of its Subject-

Specific Criteria. This assessment notwithstanding, Engineering Design-competences of graduates of both programmes appear to be rather limited, and consequently have been addressed in a major requirement (see below requirement 4). However, because of the disciplinary and procedural interrelationship between the ASIIN seal and the EUR-ACE® label, the Accreditation Commission agrees to the award of the EUR-ACE® label, albeit with the above said reservation. Hence, requirements and recommendations for the award of the ASIIN-seal are valid for the EUR-ACE® label as well.

The Accreditation Commission for Degree Programmes decides to award the following seals:

Die Akkreditierungskommission für Studiengänge beschließt folgende Siegelvergaben:

Degree Programme	ASIIN-seal	Subject-specific labels	Maximum duration of accreditation
Ba Electrical Supply	With requirements for one year	EUR-ACE®	30.09.2019
Ma Electrical Supply	With requirements for one year	EUR-ACE®	30.09.2019

Requirements and recommendations for the different seals:

For both degree programmes	**ASIIN**
1. The learning objectives for each study programme have to be defined programme-specific in the sense of indicating more precisely the skills and competences graduates should have acquired after completing the programme (“qualification profile”). Furthermore, it has to be plausibly demonstrated in an “objectives matrix” that these learning objectives are adequately reflected in the learning outcomes of the individual modules. The revised learning outcomes also need to be communicated and made accessible to students. They need to be regarded in the respective Diploma Supplement as well.	2.2, 7.2
2. The Mongolian system of credit hours and its conversion into any other credit point system must be consistent and comprehensible. Moreover, the credit hour system in use has to be made transparent and comprehensible	3.2

to relevant external stakeholders (in the Diploma Supplement, for instance).	
3. Programme-specific Diploma Supplements have to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes, structure and level of the degree, as well as about an individual's performance.	7.2,
4. It is necessary that the Engineering Design-competences of students shall be strengthened within the mandatory part of the curriculum.	2.6, 2.2
5. The module descriptions have to be revised and made accessible to the students and teachers alike according to the remarks given in the report (learning outcomes, module content, missing module descriptions (practical training and graduation works), frequency (if applicable), consistency of course/module names in English translation).	2.3, 2.2, 2.4, 2.6, 4
6. Rules for the recognition of activities completed externally have to be adopted, especially with a view to internationalization and, in particular, the mobility of students.	2.5
7. The concept of quality assurance needs to transparently implement feedback loops specifically between the HEI on the one hand and students / graduates on the other in regard to the content of modules, the workload calculation, the awarding of credit points as well as the definition of skills and competences that are addressed in the programme objectives. Thus, programme coordinators shall be enabled to recognise and adequately correct deficits in the programme.	6.1

Recommendations

For both degree programmes	**ASIIN**
1. It is strongly recommended, in the long run, to combine or conceptually integrate the different programmes dealing with power engineering in order to get a more comprehensive grasp of all parts of electrical power supply (including energy efficiency and environmental protection).	2.6, 5.3

2. It is recommended to reconsider the programme name with respect to its primary disciplinary subject (“electrical power supply”).	1, 2.2
3. It is recommended to consider enlarging or, wherever applicable, integrating small modules/courses (1 or 2 credit hours) in order to support the achievement of the intended learning outcomes.	3.1
4. It is recommended that, with a view to internationalisation, already existing efforts to enhance English language skills and to offer English-medium courses in the curriculum should be strengthened. In that respect cooperation with other HEIs, in particular HEIs abroad, should be further developed.	3.1
5. It is recommended to revise the almost entirely test-based examination methods so as to more consistently reflect the intended learning outcomes of the individual modules.	4
6. It is recommended that measures should be taken to generally improve the research capacity of the School of Power Engineering.	5.1
For the <u>Bachelor’s Degree programme</u>	
7. It is recommended to consider a more systematic preparation and prolonged duration of the industrial placement modules, or to otherwise strengthen the profession-oriented competences of students.	2.4