



European Network for Accreditation of
Engineering Education

The ENAAEE 10th Anniversary Book

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The ENAEE 10th Anniversary E-Book



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FOREWORD

In November 2016, the ENAEE Administrative Council decided to celebrate the 10th anniversary of ENAEE by publishing a book recording the origin and development of ENAEE and of the EUR-ACE® system. This book (an e-book mainly designed for electronic diffusion) is also an opportunity to pay tribute to all who have contributed to this endeavour.

The ENAEE AC nominated an editorial team: Giuliano Augusti, Pierre Compte, Ian Freeston, Günter Heitmann, coordinated by Erbil Payzin; they achieved this important work to time, and deserve the thanks and congratulations of the EUR-ACE® community.

The history of ENAEE and of the EUR-ACE® system illustrates the profound changes which occurred in the European Higher Education at the turn of the XXIth century.

EUR-ACE® is at the confluence of two important educational developments. On the one hand, the “Bologna process” aims to build a coherent, compatible and competitive European Higher Education Area (EHEA); it focuses on the academic features of European higher education: structure harmonization (cycles, ECTS credits), and common standards for internal and external Quality Assurance (European Standards and Guidelines). On the other hand, the “Lisbon agenda” of the European Commission, aims to build a “knowledge society”, with a stronger focus on the impact of higher education and research on the economy and society. The concept of quality labels like EUR-ACE® is more in line with the European Commission policy than with that of the EHEA.

ENAEE is an inclusive organisation that is open to representatives of all sectors of the engineering profession, and consequently the EUR-ACE® Framework Standards and Guidelines (EAFSG) have wide support. EAFSG are both academic and pre-professional; they specify the programme outcomes (knowledge, skills and competences) required for engineering graduates to enter the engineering profession, while being compliant with the academic Quality Assurance Standards of the European Higher Education Area.

In the following sections, the reader will understand how the founders of the EUR-ACE® system have worked, with the support of the European Commission, to match the two complementary aspects of engineering education, and how they succeeded in building a qualification framework for future professional engineers, coping with the diversity of the engineering professions and of the education systems in Europe and beyond.

Bernard Remaud, ENAEE president

INTRODUCTION

It has been more than a decade since the foundation of ENAEE (European Network for Accreditation of Engineering Education) on 8 February 2006, at the end of the first EUR-ACE® project. The ENAEE Administrative Council has decided to commemorate the 10th anniversary of ENAEE by documenting the history of ENAEE and of the EUR-ACE® system. This e-book is the result of this decision.

[Chapter 1](#) covers the early efforts and activities within the European Higher Education Area (EHEA) on quality assurance and recognition (“accreditation”) in engineering education. These early efforts can be considered as the roots of the ENAEE and the EUR-ACE® system.

[Chapter 2](#) covers the EU-funded projects that have led to the creation and widespread use of the EUR-ACE® Framework Standards. It also discusses the founding of ENAEE, the organisation that applies and maintains these standards.

[Chapter 3](#) is about the development of the ENAEE network and the EUR-ACE® Framework Standards over the years and also the benefits they provided to the development and accreditation of engineering education programmes. This chapter also covers ENAEE’s collaborations with other QA organisations with an emphasis on programme accreditation.

[The fourth and last chapter](#) presents perspectives on what lies ahead as far as engineering education and accreditation of engineering programmes are concerned.

[The three appendices](#) give a list of current and previous ENAEE Administrative Council and EUR-ACE® Label Committee members and organisations that are members of the ENAEE.

[A separate repository](#) of reference material has been created to enable easy access to many of the referenced documents. This repository may be accessed from the ENAEE web site www.enaee.eu.

Chapter 1

THE ROOTS (2000–2004)

At the end of the '90s, the debate on accreditation and quality assurance of Higher Education, and in particular of Engineering Education, was starting throughout Europe and involved Engineering Education Societies, Professional Organizations and other stakeholders. The EUR-ACE® adventure started on this background.

1.1 The Bologna process

(by Pierre Compte)

In the European Union, the Treaties provide in principle the freedom of movement of workers (art. 45)¹, the mutual recognition of diplomas and qualifications (art. 53), the development of quality education, the mobility of students and teachers, the cooperation between educational establishments (art. 165), the implementation of a vocational training (art. 166). This led to the setting-up of the European Credit Transfer System (ECTS), of the European Region Action Scheme for the Mobility of University Students (ERASMUS) Programme, of the Diploma Supplement, of the National Academic Recognition Information Centre (NARIC) network. But the actions of the EU were only incentives and excluded “any harmonisation of the laws and regulations of the Member States” (art. 165).

In April 1997 a Convention was signed in Lisbon by the Council of Europe and UNESCO aiming for the Recognition of Qualifications in Higher Education². This led to the recognition of degrees and periods of study and to the European Network of Information Centres (ENIC) network.

Wanting to progress, the Ministers of Higher Education of France, Germany, Italy and United Kingdom, meeting in May 1998 in Paris for the 800th anniversary of the Sorbonne, signed a Joint Declaration³ calling for the harmonisation

of the architecture of the European higher education system.

In June 1999, on the basis of the Sorbonne Declaration, the Ministers of Higher Education of 29 European countries met in Bologna and signed a founding Declaration⁴ aimed at the establishment of a European Area of Higher Education by 2010, through the adoption of a system of easily readable and comparable degrees, of a system essentially based on two main cycles, of a system of credits such as the ECTS system, and by the promotion of mobility for students and teachers, of European co-operation in quality assurance, of the European dimensions in higher education. Ministers agreed to meet again within two years. In the meantime a permanent group with the name Bologna Follow-Up Group (BFUG) was set up in charge of the implementation of the Declaration.

Subsequent conferences emphasized: Taking into account of Lifelong learning; Involvement of institutions and students; Attractiveness of the European Higher Education Area (EHEA)⁵ (Prague, May 2001); Statement of Higher education and Research as the two pillars of the knowledge based society; Enlargement of the BFUG⁶ (Berlin, September 2003); Adoption of the European Standards and Guidelines (ESG) (see 1.2); Social dimension of Higher education⁷ (Bergen, May 2005); Establishment of Qualification Frameworks; Taking into account a third cycle for doctoral degrees⁸ (London, May 2007); Equitable access to Higher education; Employability of graduates;

1 The numbers of the articles are those of the Consolidated Treaties

2 Council of Europe, Convention on the Recognition of Qualifications concerning Higher Education in the European Region, European Treaty Series No. 165, Lisbon 11 April 1997.

3 Sorbonne Joint Declaration: Joint declaration of the architecture of the European higher education system, Paris, the Sorbonne, 25 May 1998.

4 The Bologna Declaration: Joint declaration of the European Ministers of Education, Bologna, 19 June 1999.

5 Towards the European Higher Education Area: Communiqué of the meeting of European Ministers in charge of Higher Education, Prague, 19 May 2001

6 Realising the European Higher Education Area: Communiqué of the Conference of Ministers responsible for Higher Education, Berlin, 19 September 2003.

7 The European Higher Education Area – Achieving the Goals: Communiqué of the Conference of European Ministers Responsible for Higher Education, Bergen, 19-20 May 2005.

8 Towards the European Higher Education Area: responding to challenges in a globalised world, London Communiqué, 18 May 2007

Non-formal learning; Transnational transparency⁹ (Leuven-Louvain-la Neuve, April 2009).

In March 2010, which was the deadline initially fixed in Bologna, the Ministers signed a new Declaration¹⁰ in Budapest and Vienna, giving new 2020 guidelines for the EHEA, which now comprises 48 countries.

Recent conferences stressed: Investing in higher education for the future, providing quality higher education for all¹¹ (Bucharest, April 2012); Enhancing the quality and relevance of learning and teaching, Fostering the employability of graduates throughout their working lives, Making the systems more inclusive, Implementing agreed structural reforms¹² (Yerevan, May 2015).

1.2 Quality Assurance in Higher Education

(by Pierre Compte)

The Treaties (art. 165) give competence to the European Union to *“contribute to the development of quality education by encouraging cooperation between Member States and, if necessary, by supporting and supplementing their action”*.

In accordance with that, the European Council adopted in September 1998 a *Recommendation on European cooperation in quality assurance in higher education*¹³ which recommends that Member States establish transparent quality assurance systems in HE, and indicates features of quality assurance: independence of the bodies in charge of quality assurance, criteria linked with the needs of society, need for internal and external assessment, involvement of the stakeholders.

Linked with that, in June 1999, the Bologna Declaration (see 1.1) called for *“European*

co-operation in quality assurance, with a view to developing comparable criteria and methodologies”.

As a result in May 2000 the relevant agencies established the European Network of Quality Assurance in Higher Education (ENQA), which became in November 2004 European Association for Quality Assurance in Higher Education (ENQA).

In Prague in May 2001, the Ministers of the Bologna process *“called upon the universities and other higher education institutions, national agencies and the ENQA, in cooperation with corresponding bodies from countries which are not members of ENQA, to collaborate in establishing a common framework of reference and to disseminate best practice”*. In Berlin in September 2003, they called *“upon ENQA through its members, in co-operation with the EUA, EURASHE and ESIB, to develop an agreed set of standards, procedures and guidelines on quality assurance, to explore ways of ensuring an adequate peer review system for quality assurance and/or accreditation agencies or bodies”*.

The resulting European Standards and Guidelines (ESG) prepared by ENQA were adopted by the Ministers in Bergen in May 2005¹⁴.

The ESG consist of three parts:

1. Standards and guidelines for internal quality assurance within higher education institutions
2. Standards and guidelines for the external quality assurance of higher education
3. Standards and guidelines for external quality assurance agencies

The Bergen conference called also for the setting-up of a European Register of Quality Assurance Agencies which would include agencies compliant with the ESG. In February 2006, the European Parliament and Council adopted a new Recommendation¹⁵ which endorses the ESG and call also for such a Register.

9 The Bologna Process 2020 - The European Higher Education Area in the new decade: Communique of the Conference of European Ministers Responsible for Higher Education, Leuven and Louvain-la-Neuve, 28-29 April 2009.

10 Budapest - Vienna Declaration on the European Higher Education, 12 March, 2010.

11 Making the Most of Our Potential: Consolidating the European Higher Education Area, Bucharest Communique, EHEA Ministerial Conference, Bucharest 2012.

12 Yerevan Communique, EHEA Ministerial Conference, Yerevan 2015.

13 Council Recommendation of 24 September 1998 on European cooperation in quality assurance in higher education (98/561/EC), Official Journal of the European Communities, L 270/56, 07.10.1998.

14 ENQA report on Standards and Guidelines for Quality Assurance in European Higher Education Area, 2009 Helsinki, 3rd Edition.

15 European Parliament and Council, Recommendation of the European Parliament and of the Council of 15 February 2006 on further European cooperation in quality assurance in higher education, Official Journal of the European Union, L 64/60, 04.03.2006.

In March 2008 was therefore created by the E4 Bologna group (ENQA, EUA, EURASHE and ESIB) the European Quality Assurance Register (EQAR).

In April 2012 in Bucharest the Ministers of the Bologna process called for the revision of the ESG. The new version was adopted in Yerevan in May 2015¹⁶.

The main features of the ESG are:

- The Higher Education Institutions should have a policy for quality assurance involving stakeholders
- They should have processes for the design and approval of their programmes
- They should have published regulations for student admission, progression and certification
- They should undergo external quality assurance in line with the ESG
- External quality assurance should be carried out by external experts, including students
- Reports and decisions should be published
- Agencies should have an established legal basis and should be recognised by competent authorities
- They should be independent and act autonomously and should publish reports.

At the same time initiatives were developed to define a Qualification Framework

In 2001, several academics and researchers from different countries launched a Joint Quality Initiative (JQI) in order to compare Frameworks existing in different countries. In Dublin in March 2004, the JQI published descriptors for each level of Higher Education, the so called Dublin Descriptors. Those descriptors¹⁷ specify for each level of Higher education (short cycle, 1st cycle, 2nd cycle, 3rd cycle) the required competences for Knowledge and understanding, Applying knowledge and understanding, Making judgements, Communication and Lifelong learning skills.

In Berlin in 2003 the Bologna ministerial conference had called for the elaboration of an “overarching framework of qualifications for the

European Higher Education Area”. This Framework for Qualifications of the EHEA¹⁸ taking in account the Dublin descriptors, was approved in Bergen in 2005 by the Bologna ministerial conference which endorsed both the Framework and the Descriptors.

In parallel, the Directors General for vocational education and training (VET) in EU, meeting in Bruges in October 2001, launched the so called Bruges Initiative in order to enhance co-operation and recognition for VET in Europe. Ministers of 31 countries endorsed this initiative in Copenhagen in November 2002¹⁹. This so called Bruges-Copenhagen Process resulted in EU actions for transparency of VET skills in Europe, and finally in a European Qualification Framework (EQF)²⁰. EQF defines eight levels in terms of Knowledge, Skills and Competences, with levels 5 to 8 for Higher education endorsing the Dublin Descriptors. Each Member State is invited to establish a National Qualification Framework.

1.3 The European Standing Observatory for the Engineering Profession and Education (ESOEPE)

(by Giuliano Augusti)

Within the discussions on accreditation and quality assurance of Higher Education, and in particular of Engineering Education, quoted at the beginning of this Chapter, the European Economic Interest Group (EEIG) “Higher Engineering Education for Europe (H3E)” proposed and activated an EU Thematic Network whose Working Group wg2 organised and ran two “European Workshops for Accreditation/Assessment of Engineering Programmes” (EWAEPs), in The Hague (3-5 December 1998) and Paris (18-19 June 1999).

16 Standards and Guidelines for Quality Assurance in European Higher Education Area (ESG), (2015). Brussels, Belgium.

17 Shared 'Dublin' descriptors for Short Cycle, First Cycle, Second Cycle and Third Cycle Awards - A report from a Joint Quality Initiative informal group (Dublin, 18 October 2004)

18 A framework for qualifications for the European Higher Education Area (2005)

19 Declaration of the European Ministers of Vocational Education and Training, and the European Commission (Copenhagen 30 November 2002)

20 Recommendation (2008/C 111/01) of the European Parliament and of the Council on the establishment of the European Qualifications Framework for lifelong learning (23 April 2008)

In September 2000, on the occasion of a SEFI Conference held in Paris, the representatives of six diverse organizations that had been active in the EWAEPs signed an Agreement “intended to build confidence in systems of accreditation of engineering degree programmes within Europe [...], to assist national agencies and other bodies in planning and developing such systems, [...] to facilitate systematic exchange of know-how in accreditation and permanent monitoring of the educational requirements in engineering formation...” and established the “European Standing Observatory for the Engineering Profession and Education” (ESOEPE)²¹.

ESOEPE adopted in 2001 the following definition of “accreditation” of an Engineering Higher Education programme, that has afterwards with minimal variants become the consensus definition:

Accreditation is the primary quality assurance process used to ensure the suitability of an educational programme as the entry route to the engineering profession. Accreditation involves a periodic audit against published standards of the engineering education provided by a particular course or programme. It is essentially a peer review process, undertaken by appropriately trained and independent panels comprising both engineering teachers and engineers from industry. The process normally involves both scrutiny of data and a structured visit to the educational institution.

and convened a third EWAEP (Darmstadt, 26 January 2001).

Then ESOEPE tried unsuccessfully for a few years to find motivations and sources of support, until the good opportunity came in 2004 with the Call issued by the European Commission, DG “Education and Culture” for project proposals aimed at “setting up European accreditation in certain professions/disciplines on the Socrates/Tempus lines”.

ESOEPE could not respond formally to this Call because it had never been registered as a legal entity, but was instrumental in promoting the application for the EUR-ACE® project. At the end of the project, ESOEPE was dissolved and transformed into ENAEE, the European Network for Accreditation of Engineering Education... but for this history the reader is referred to the succeeding sections and chapters of the present eBook.

1.4 Engineering Education in EU networking projects:

the H3E (Higher Engineering Education for Europe) and E4 (Enhancing engineering education in Europe) networks (1998–2012)
(by Giuliano Augusti and Claudio Borri)

As already noted (§ 1.3), at the end of the ‘90s, a lively debate on relevant topics of Higher Education, and in particular of Engineering Education, was increasingly spreading throughout Europe.

This debate was facilitated by the “Socrates” EU Programme, and in particular by its provision of “Thematic Networks” that could – and indeed did – revolve around a broad theme in Higher Education Institutions (Universities and analogues), Engineering Education Societies, Professional Organizations and other stakeholders.

The EU “Thematic/Academic Networks” on Engineering Education started in 1997 with the EEIG named “H3E-Higher Engineering Education for Europe”²² (1997–99). The work continued under the leadership of the University of Florence, Faculty

21 ESOEPE Agreement, 2000: the founder members of ESOEPE in September 2000 were:

- UK: EC (now EngC)
- FR: CTI
- DE: ASII (now ASIIN)
- PT: OE (Ordem dos Engenheiros)
- IT: CoPI
- EU: E4 (temporary network, later TREE, then dissolved)

22 The EEIG named H3E was formed by a consortium composed of CESAER (Conference of European Schools for Advanced Education & Research, SEFI (Société Européenne pour la Formation des Ingénieurs) and BEST (Board of European Students in Technology)

of Engineering, with “E4-Enhancing engineering education in Europe” (2000-04); “TREE-Teaching and Research in Engineering in Europe” (2004-08) and finally “EUGENE (European and Global Engineering Education)” (2009-12).

The core issues of European Engineering Education treated by H3E, E4 and TREE, together with other connected activities, are summarized in Borri et al.²³(2007). The outcomes of the later EUGENE Network can be found under www.eugene.unifi.it.

Quality assurance and engineering programme accreditation has been dealt with continuously throughout the 15 years of life of the above

Networks: this work, with contribution of a plethora of stakeholders throughout Europe, laid the basis for the EUR-ACE® project and its proposals, and then supported its implementation and development.



TREE session, 9.09.2005 (Francesco Maffioli, Guy Haug, Claudio Borri)

1.5 Motives and Contribution of European Partner Organisations

1.5.1 Motives and contributions of FEANI (by Dirk Bochar)

FEANI (Fédération Européenne d'Associations Nationales d'Ingénieurs) is a federation of professional engineers that unites national engineering associations from 34 European Higher Education Area (EHEA) countries. Thus, FEANI represents the interests of over 3.5 million professional engineers in Europe. Through its activities and services, especially with the attribution of the EUR ING professional title, FEANI aims to facilitate the mutual recognition of engineering qualifications in Europe and to strengthen the position, role and responsibility of engineers in society. The General Secretariat of FEANI, managing the activities of the federation, is located in Brussels since late 1997²⁴.

The start of ENAEE:

When in early 2000 the stage was set for what on 9 September that year would become “ESOEPE” or the “European Standing Observatory for the Engineering Profession and Education, FEANI was already involved in the Thematic Network “E4 - Enhancing Engineering Education in Europe”, led by the University of Florence (UNIFI). Key players included FEANI National Members from the UK, Portugal and France, while FEANI itself was not a signatory of that initial Agreement.

On 29 November 2001, it was decided that FEANI would accommodate the ESOEPE Permanent

Secretariat. FEANI continued this activity with the first EUR-ACE® project (2004-2006). The first ENAEE General Assembly was subsequently hosted by FEANI on 30 March 2006 at the FEANI premises in Brussels. The FEANI Secretary General at the time, Mr. Philippe WAUTERS, was appointed Member and Treasurer of the first ENAEE Administrative Council (renewed for a second term as of 1 April 2009). FEANI was instrumental in the official founding of ENAEE as an international not-for-profit association according to Belgian law (AISBL).

23 C.Borri, E.Guberti, F.Maffioli: SOCRATES THEMATIC NETWORKS: Contributions to mutual knowledge and recognition of Engineering Education in Europe; International Conference on Engineering Education - ICEE 2007, Coimbra, Portugal, 3-7 September 2007.

24 More information on FEANI is available at www.feani.org

The following years of FEANI's involvement in ENAEE

From the beginning, FEANI had been a dedicated supporter of the activities and purpose of ENAEE as an association pursuing scientific and pedagogical goals related to the accreditation practice and quality assurance of engineering education programs. This was coherent and in line with the FEANI corporate objectives, which aimed at:

- affirming the professional identity of engineers in Europe
- promoting excellence in the education, training and continued professional development of those engaged in engineering in the countries of the National Members
- ensuring that the professional qualifications of the engineers of the countries of the FEANI National Members are acknowledged in Europe and world-wide
- encouraging excellence, creativity and innovation in engineering and in research, development and design in the manufacture of engineering products and in the provision of engineering services.

Furthermore, FEANI felt that while cooperating with ENAEE it would facilitate the exchange of information and foster a wider dissemination of scientific, technical and other information relevant to engineering between Members and other interested bodies. While doing so, it would also support multilateral collaboration between National Members and other interested bodies, ensuring that each institution would retain its own legal autonomy and independence.

As of 2007, the FEANI European Monitoring Committee (EMC) decided to automatically accept all EUR-ACE[®] registered programmes to be included into the FEANI INDEX. This implied that the EUR-ACE[®] labelled programmes were accepted as the educational basis for applications for the FEANI EUR ING professional title. The EUR ING formula stipulates that the minimum standard for engineering formation is an accumulated record of seven years, composed of a minimum of engineering education for 3 years and a minimum of professional engineering experience of at least 2 years after having obtained the degree.

1.5.2 Motives and contributions of SEFI

(by Françoise Côme)

SEFI (Société Européenne pour la Formation des Ingénieurs) is an international non-profit organisation established 19 January 1973 in Belgium and founded by 27 European Universities and engineering schools. Its mission is to contribute to the development and improvement of engineering education in Europe and to the enhancement of the image of both engineering education and engineering professionals in Society²⁵.

Already in the 1990's²⁶ and moreover in the context of the Bologna Declaration and its impact on higher education (HE) in general and in engineering education in particular (HEE), the accreditation of engineering education (EE) has been a topic that stimulated intense discussion within SEFI. As a follow up of its Annual Conference held in 2000 in Paris on "The Many Facets of International Engineering Education", that included many contributions precisely on topics such as mutual recognition, accreditation and quality assessment, SEFI decided to be even more committed in accreditation of EE and to therefore support the very first initiative aiming to establish a European platform to develop policies for accreditation and mutual recognition in EE, the already quoted "ESOEPE" studying the feasibility of a real and effective European Accreditation System for EE programmes. SEFI has been a major supporter of ENAEE's creation, and in this context, it has been deeply involved over the last decade in ENAEE's governing bodies and numerous activities, notably through the activities of its Working group on Quality Assurance and Accreditation in EE founded in 2011 and successively chaired by the late Prof. Francesco Maffioli, Dr. Angela Varadi, and since 2014 Prof. Anne-Marie Jolly, who is also currently representing SEFI in the ENAEE Administrative Council, succeeding me in this role.

Because accreditation of EE programmes is crucial for ensuring transparency and hence building trust, favouring mobility of students and engineers in a context of a large diversification of HE institutions

25 More information on SEFI is available at www.sefi.be.

26 The introduction of the ABET criteria 2000 with special relevance to engineering educators had been analysed by SEFI late President Walter Schaufelberger (ETHZ) in "Criterion 3 - Programmes Outcomes and Assessment" SEFI Annual Report 1999

and programmes, new branches' diversity, mass studies engendering a strong competition for institutions resources and students, the importance of maintaining a high quality in education and research - one of the SEFI's "raison d'être"- for all these reasons, the need for defining a European accreditation tool was and still is judged as essential by SEFI's past and present leaders. Furthermore, and as it is described in other chapters of this commemoration book, SEFI has contributed in all former EU Thematic & Academic Networks (TNs) projects, generally dedicated to EE but with always a line specifically devoted to accreditation and quality assurance, and known as "H3E", "E4", "TREE", "TREE-diss" and "EUGENE".

In 2001 a first position paper on Accreditation had already been published by SEFI followed by a second one in 2012 in which SEFI encouraged all its institutional members to apply for EUR-ACE® labels for their programmes, whilst suggesting to its members in countries that had not yet an established EE accreditation procedure, to solicit the relevant authorities in this direction, and in the meantime to take advantage of the possibility to let one of the EUR-ACE®-authorized agencies accredit their EE programmes. In this context SEFI notably participated in the EUR-ACE® Spread, Lebanese Engineering Programme Accreditation Commission (LEPAC) and QUEECA EU SOCRATES and TEMPUS projects.

Let me conclude this contribution by expressing our congratulations and special thanks for their amazing work to all those who have played a crucial role in these successful first decade of ENAEE, ENAEE's founders and members, former and present governing Board, Presidents, Label Committee members, many of them, such as Giuliano Augusti, Torbjörn Hedberg, Claudio Borri, Günther Heitmann, Francesco Maffioli, having also been corner stones of SEFI accreditation activities.

1.5.3 Motives and contributions of EUROCADRES

(by Michel Rousselot)

The Council of European professional and managerial staff EUROCADRES is a cross industry recognised social partner, which represents engineers and other qualified professions, with

more than five million members throughout Europe in all branches of industry, public and private services and administrative departments.

EUROCADRES has always considered the right of free movement of people as a very important element of the European citizenship. To this end, recognition of qualification and diplomas, and quality of higher education are crucial.

Among the various professions, EUROCADRES paid a great attention to engineers by the setting up of a specific working group linked to a EUROCADRES network for engineers in the main European countries (according to countries EUROCADRES membership comprises either specific organisations for engineers or organisations with various professions together including engineers). In particular, EUROCADRES was involved in a number of European projects related to engineers such as: "EURORECORD", a European record of achievement for engineers (1996-1997), "PROGRESS", the professionalisation of graduate engineers (1998-2000), ENQHEEI, European network for quality of higher engineering education for industry (leading to a quality charter and further developments) (2000-2002). EUROCADRES established cooperation both at European level, particularly with FEANI, and at global level mainly for organising two international conferences for professional engineers and scientist organisations in Melbourne (1999) and in Copenhagen (2003).

From the beginning EUROCADRES supported the "Bologna process" (launched in 1999) aimed to a European higher education area, and was recognised as a "partner" of the process. The "Bruges initiative" (2002) focused on vocational education and training with the target of a "single tool for transparency". In the same time EUROCADRES, was part of the "high level task force on skills and mobility" (2001) and was involved in European discussions, related to the European credit transfer system (ECTS), to the setting up of a "diploma supplement" and a European CV (2002), to the "framework of actions for lifelong development of competences and qualifications" (2002) signed by the European social partners (employers and trade-unions), to the new directive merging 15 existing directives for recognition of qualifications for regulated professions (2001-2003), to the European Commission recommendations on

recruitment of researchers (2004–2005) and to assurance quality in higher education (2005), etc.

Through a number of discussions with the European Commission and other institutions EUROCADRES stressed the need of further progress : genuine recognition of qualifications and diplomas, tools for transparency and quality assurance processes cannot stand alone, they must be concluded by an accountable decision concerning their results, which is the role of an accreditation process. In 2000, EUROCADRES suggested²⁷ the setting up of "quality and accreditation process for education and training in wide professional sectors". It has not been easy to persuade the European commission, but finally, after further discussions, the General Directorate "education and culture", (while refusing additional funding to ESOEPE) decided in February 2004, to launch a call for proposals about feasibility of accreditation processes for some professions, including engineers.

For EUROCADRES it was a significant result of its commitment. EUROCADRES supported the setting up of a consortium, as broad as possible, making use and enlarging ESOEPE experience, coordinated by FEANI, in order to submit a proposal for engineers. This proposal named EUR-ACE[®] (European accreditation of engineering programmes) was accepted and took place from 2004 to 2006. EUROCADRES has been fully involved in the project board and in the steering committee. At the beginning of the project, EUROCADRES proposed some key objectives²⁸:

- European accreditation based on the national existing accreditation bodies, including both criteria and process;
- Common criteria including academic criteria and professional outcomes;
- Common standards periodically reviewed and improved, by a quality assurance approach;
- Common processes with periodic reports;
- Implementation by national accreditation bodies, awarded by EUR-ACE[®], and common standards managed by a European steering body composed with academic and professional representatives.

In addition, during the development of the project, EUROCADRES laid great stress upon:

- Involvement of engineers' organisations in the accreditation process;
- Need, for audit teams, to get in touch with stakeholders of the profession (including employers organisations and engineers trade-unions);
- Taking into account professional internship in the programmes;
- Taking into account ethical, social environmental issues in the required skills;
- Availability and use of the standards not only for education of students but also for apprenticeship and for lifelong learning processes.

Most of those elements were taken into consideration in the EUR-ACE[®] Framework standards for accreditation of engineering programmes approved in November 2005, and later in the foundation of ENAEE (see section 2.2).

1.6 Incentives and contributions of the European Commission

(by Guy Haug)

The European Commission has played a key role in two main processes that have been shaping quality assurance (QA) in European higher education over the past two decades.

- One is the Bologna Process for the development of an internally coherent and externally competitive European Higher Education Area (EHEA). It started in 1998 as an intergovernmental initiative and gradually encompassed all EU Member States and some 20 additional countries. The Commission became a member of the Bologna Follow-Up Group (BFUG) and has supported the preparatory work (including the series of "Trends Reports") for the monitoring and development of the Bologna agenda between the bi-annual meetings of national Ministries.

27 For a European Area of Mutual Recognition of Qualifications and Diplomas (EUROCADRES, January 2000)

28 For a European framework of accreditation in Higher Engineering Education, EUR-ACE[®] project (EUROCADRES, October 2004)

- The other is the Agenda for the Modernisation of Higher Education, which emerged from 2001 as an important strand of the EU's Lisbon Strategy for the Europe of Knowledge. This agenda was developed more specifically for the EU and its member States, but it actually endorses the pan-European Bologna reforms and adds to them in the context of the EU by means of EU tools (Funds, programmes, Commission Communications, Council and Parliament Recommendations, etc.).

As part of this dual agenda, the Commission could support a series of initiatives that have paved the way to the later emergence of ENAEE as a European (not national) quality assurance body and EUR-ACE® as a European (not national) quality seal for engineering education.

Among these initiatives are the following milestones:

- Setting up of various “thematic Networks”, including in Engineering Education; these schemes laid the ground for the support provided by the European Commission to sectoral initiatives such as the series of EUR-ACE® projects that are described in Chapter 2 of the present document.
- 1998 Recommendation²⁹ for the development of internal QA systems at universities and of external QA agencies in the Member States, together with their linkage at European level by means of the Association for QA in HE (ENQA).
- Support from 2003 of the European Consortium for Accreditation (ECA), which became a major innovation platform in QA in Europe, in particular for such complex issues as the mutual recognition of accreditation decisions, internationalisation and QA for multinational programmes.
- Adoption of the European Qualifications Framework for Higher Education (2005), which served as a main reference for the two levels of EUR-ACE® accreditation.
- 2006 Recommendation³⁰ on the strengthening of European cooperation in QA in HE, which endorsed the European Standards & Guidelines (ESG) adopted in 2005 by Bologna

ministers, upheld the right of European universities to apply to QA agencies outside their own country and called for the creation of the European Register of recognised QA agencies (which became EQAR); on this basis, the Commission provided continued support the series of EUR-ACE® projects described below in Chapter 2.

- 2009 Communication of the Commission on progress in QA in HE³¹ which acknowledged that QA in HE lacked a stronger European dimension, called for stronger implementation measures of the 2006 Recommendation and, in particular, for the further development of European quality assurance schemes specific to certain disciplines or professional areas (e.g. the long standing EQUIS label in Management Education, the then emerging EUR-ACE® seal in Engineering Education and some comparable initiatives in other areas).

29 Recommendation 98/561/EC

30 Recommendation 06/143/EC

31 European Commission: Report on progress in quality assurance in higher education, COM(2009) 487 final, Brussels, 21.9.2009

Chapter 2

THE EUR-ACE® PROJECTS (2004–2008): BIRTH OF EUR-ACE® STANDARDS AND ENAEE

In 2004 Engineering Education became a key aspect of the Lisbon Strategy and Bologna Process, as proved by the developments described in this Chapter.

2.1 The call for projects from the European Commission and the constitution of the EUR-ACE® consortium (by Pierre Compte)

In 2002, the European Commission Directorate General for Education and Culture (DG-EAC) launched a call for proposals for the second phase of the Leonardo da Vinci Programme for vocational education and training. ESOEPE network decided to apply in a project called European Observatory on Accreditation of Engineering Education (EOAEE). The application was established in February 2003. The intended aim of this project was the enhancement of co-operation in accreditation activities, with an exchange platform in order to set-up an observatory of data and practices³². But in July 2003, the project was not accepted by the EC³³.

In fact, since 2000, many elements had led EU to be more proactive in the Higher Education field.

In March 2000 the European Council adopted the so-called “Lisbon Strategy” aiming to “make Europe, by 2010, the most competitive and the most dynamic knowledge-based economy in the world”. In its Barcelona meeting in March 2002, the Council had taken in account the Bologna Process as fitting

into the Lisbon Strategy as its Higher Education component.

In Europe, other stakeholders had also called EU to go forward. EUROCADRES had called in January 2000 for a European area of mutual recognition of qualifications and diplomas (1.5.3), FEANI wanted to link the EUR-ING system to the Bologna Process, ENQHEEI network called for a European label in Higher Engineering Education.

In this context the EC (DG-EAC) convened a meeting in Brussels the 13 February 2004³⁴ with all stakeholders. P. Van der Hijden presented the EU note “From Berlin to Bergen”³⁵ precisising that evaluation and accreditation had to become more comparable and more European, and that there was scope for trans-national evaluation and accreditation in fields of study such as business and engineering. The EC wanted to push forward accreditation system at a European level in order to avoid universities and users seeking for an accreditation system from outside Europe. G. Haug presented a note calling for “a European clearinghouse” in Higher Education Quality³⁶.

The EC announced the next launching of a call for proposals for “Setting up European accreditation in certain professions/disciplines”, with a deadline 16 April 2004. It was precisised that the partnership had to be wider than ESOEPE so that a consortium of all present institutions would be welcomed, and that the proposal had to be ambitious, going further than a simple mutual recognition agreement like the Washington Accord³⁷.

32 Extract from EAOEE proposal - February 2003.

33 EC letter dated 18.07.2003 on EAOEE proposal

34 Participants: Maffioli (E4), Augusti (E4), Pugh (Engineering Council - UK), Wauters (FEANI), Siwak (CTI - France), Compte (EUROCADRES), Bernard (ENQHEEI), Staropoli (ENQHEEI), Maury (CEFI - France), Zamardo (MEDA), Graafmans (CESAER), Manoliu (EUCEET - UACE - Romania), Van der Hijden (EC/DGEC), Haug (EC/DGEC)

35 From Berlin to Bergen: The EU Contribution, European Commission, Brussels, 17 February 2004/Rev A2/PVDH (final)

36 G. Haug, Quality assurance/accreditation in the emerging European higher education area: a possible scenario for the future, European Journal of Education, 3/2003, September 2003.

37 www.ieagrements.org/accords/washington

All partners³⁸ met in Genoa in 1 April 2004 and set-up the application for a project called EUR-ACE[®] (Accreditation of European Engineering Programmes and Graduates). EUR-ACE^{®39} aimed to establish and test a common framework of standards and procedures for accreditation of Higher Engineering Education, and propose an organisation in order to award a label for the compliance with those standards (details in section 2.2). A general agreement was reached on two key points:

- The accreditation must remain managed by the existing agencies: the label has to be additional;
- There is need for two sets of standards respectively for Bachelor and Master level (or First and Second Cycle Degrees, as then defined)

2.2 Development of the EUR-ACE[®] project (2004–2006): setting up of the ENAEE network (by Giuliano Augusti)

2.2.1 EUR-ACE[®] Project

The proposal for the EUR-ACE[®] project was presented, under the auspices of ESOEPE, by 14 partners covering a wide range of organizations concerned with recognition and accreditation of engineering education (from the academic and/or professional side): 6 partners were associations or networks covering several European countries (among them, FEANI, SEFI and EUROCADRES), while 8 were bodies active in accreditation of engineering programmes on the national scale⁴⁰ in 8 countries, all within the area of the Bologna process, but not all included in the EU or among the “candidate countries”: these partners will be indicated as “EUR-ACE[®] accrediting partners” in the following.

As stated in the project, the objective of EUR-ACE[®] was to propose a framework for setting up a European system for accreditation of engineering education at the First Cycle and Second Cycle level (as defined within the Bologna process, and now called Bachelor and Master respectively), with the following main aims:

- a. providing an appropriate “European label” to accredited educational programmes;
- b. improving the quality of educational programmes in engineering;
- c. facilitating trans-national recognition by the label marking;
- d. facilitating recognition by the competent authorities, in accord with EU Directives;
- e. facilitating mutual recognition agreements.

The basic assumption of the EUR-ACE[®] project was that its aims could only be achieved by reaching a European-wide consensus on standards required from educational programmes, including measures for self-assessment and Quality Assurance (QA), and by setting up a system for accrediting programmes and Institutions able to guarantee the achievement of such standards. The main outcomes of the EUR-ACE[®] project were a set of “EUR-ACE[®] Standards and Procedures for the Accreditation of Engineering Programmes” (see the following section 2.3) and a proposal on how to run a pan-European accreditation system: see Section 2.2.2 below.

Although methods for QA were not explicitly tackled by the EUR-ACE[®] project, the respect of an agreed set of standards does require the adoption of QA procedures: hence, the introduction of an accreditation system contributes to the improvement of quality of the educational programmes: indeed, the proposed EUR-ACE[®] label was quoted by the European Commission as a ‘European Quality Label’⁴¹.

It is also to be underlined that EUR-ACE[®] accredits programmes as *entry route to the engineering profession* (sometimes defined “*pre-professional accreditation*”): other possible aims, e.g. facilitating academic mobility of students, or careers in other professions (including research), are outside its

38 The 14 participating institutions were: FEANI, SEFI, CESAER network, EUROCADRES, EHQHEEI, German ASIIN, French CTI, Irish IEI, Italian CoPI, University of Florence (E4 and TREE networks), Portuguese OE, Romanian UAICR, Russian RAEE, and British ECUK

39 Final EUR-ACE[®] application, 16.04.2004

40 ASIIN (Germany), CTI (France), IEI (Ireland), CoPI (Italy), OE (Portugal), UAICR (Romania), RAEE (Russian Federation)(later AEER), ECUK (UK).

41 European Commission: Report on progress in quality assurance in higher education, COM(2009) 487 final, Brussels, 21.9.2009, p9.

scope. It should also be underlined that EUR-ACE® is concerned with the accreditation of “*educational programmes*” only, and not with the accreditation or evaluation of Institutions or Departments.

Note also that EUR-ACE® does not distinguish between engineering branches (disciplines): therefore, in actual accreditations it may be complemented by branch-specific requirements. Also, EUR-ACE® does not explicitly refer to, but on the other hand does not exclude, e-learning (distance learning) and lifelong learning programmes. However, some adaptation would be needed to apply them to such programmes.

Summing up, the EUR-ACE® Standards appear flexible enough to accommodate national and subject differences, and to leave the door open to future developments.

Although professional recognition of the engineering titles is the ultimate goal of accrediting educational programmes, further qualifications (e.g. State exams) and/or training is required in some countries in order to practice the engineering profession: the harmonization of these requirements is not at stake at this moment (it was a theme forecast for the new Directive on professional qualifications) nor is within the concern of EUR-ACE®.



EUR-ACE® Project Board (La Sapienza, Rome, 25.11.2004)

2.2.2 Birth of ENAEE

The EUR-ACE® project drafted also a proposal for creating a European engineering accreditation system by a bottom-up approach, involving in an active role all national agencies accrediting engineering degrees, which were forecast to stipulate a multilateral mutual recognition agreement (now the EUR-ACE® Accord). The system involved initially the eight countries where EUR-ACE® “Accrediting Partners” operated, and later was extended to more countries within the “Bologna process” area: note that the EUR-ACE® system does not aim at substituting, but rather at coordinating and harmonizing national accreditation systems.

In order to implement this proposal, in February 2006 the eight already active accreditation agencies (EUR-ACE® “Accrediting Partners”) together with six other organisations⁴² established an Association, called “European Network for Accreditation of

Engineering Education - ENAEE”, that registered the EUR-ACE® Trademark and authorizes National Agencies that fully comply with the EUR-ACE® Standards to add the EUR-ACE® label in their accreditation certificates (see www.enaee.eu).

Similarities can be noted between this system and the “Washington Accord”, that had worked efficiently for more than a decade: however, rather than recognizing each other’s accreditations, all EUR-ACE® participating agencies recognize the common EUR-ACE® label (see section 3.3).

The implementation of this system has encountered difficulties and has been perhaps slower than optimistic previsions, but it is overall positive and hopefully will lead to further developments: see Chapter 4.

⁴² Founding members of ENAEE were ASIIN (Germany), CTI (France), IEI (Ireland), CoPI (Italy), OE (Portugal), UAICR (Romania), RAEE (Russian Federation)(later AEER), ECUK (UK), SEFI, FEANI, EUROCADRES, CLAIU, IGIP, CNEAA (RO).

2.3 The first EUR-ACE® standards and guidelines

(by Ian Freeston)

At a meeting of the EUR-ACE® Project Board on 18 June 2004 at the Engineering Council it was agreed that a small group should draft a framework of standards and guidelines, and Iring Wasser (ASIIN), Alfredo Squarzoni (CoPI) and Ian Freeston (Engineering Council UK) were appointed. The purpose of the framework was to specify the requirements of the standards and procedures of an accrediting agency for its accreditation decisions to be recognised internationally by other agencies as consistent with the educational standards necessary for professional engineering status. Several drafts were circulated to the membership for comments and suggestions, and the following fundamental principles of the framework were agreed.

- It should be applicable to all engineering disciplines and to both First and Second Cycles.
- It should be applicable to developing and future technologies.
- It should respect the different traditions and methods of teaching and of engineering formation.
- It should specify what is to be achieved but not how it is to be achieved.

Consequently, in order to accommodate the different historic traditions of engineering teaching and formation within different countries, the framework specified the outcomes of accredited programmes. The resulting *Framework Standards for the Accreditation of Engineering Programmes* was approved by the EUR-ACE® Steering Committee on 17 November 2005⁴³. The Framework had four sections specifying the requirements for an agency to be authorised to award the EUR-ACE® label.

1. Programme Outcomes for Accreditation. This section described the Programme Outcomes (i.e. the knowledge, understanding, skills and abilities which an accredited engineering degree programme must enable a graduate to demonstrate) that should be specified by an accreditation agency in its standards for the

- accreditation of degree programmes
2. Guidelines for Programme Assessment and Programme Accreditation. These guidelines indicated the resources and infrastructure required to support an accredited programme.
3. Procedures for Programme Assessment and Programme Accreditation. This section described the minimum expectations of the evaluation processes and methods of the accrediting agency.
4. Recommended Template for the Publication of Results. The template was suggested as a comprehensive way of recording the outcome of accreditation decisions to enable them to be consistently interpreted.

The framework was tested by using it to evaluate the accreditation methods, procedures and standards of the six accreditation agencies represented on the EUR-ACE® Steering Committee. It was used by ENAEE after its foundation in 2006 until 2015, when a new version was developed (see section 3.5).

In the first section which states the requirements for Programme Outcomes there were 21 individual programme outcomes for first cycle degrees and 19 for second cycle, and they were grouped under six headings:

Knowledge and understanding,
Engineering analysis,
Engineering design,
Investigations,
Engineering practice,
Transferable skills.

The first two of these groups are concerned with the understanding of fundamental science and mathematics that underpins each branch of engineering, and with the ability to use such knowledge to analyse engineering problems. The third and fourth groups identify the skills and know-how to carry out engineering investigation and design, and the last two groups list the practical and personal skills required of an engineering professional.

In specifying the requirements of accreditation agencies the term Programme Outcomes was used to avoid any possible confusion with Learning

⁴³ EUR-ACE® Framework Standards for the Accreditation of Engineering Programmes, 17 Nov. 2005. This document is available in the ENAEE e-book repository.

Outcomes. Learning Outcomes include statements of what is to be achieved by a student in individual course units/modules and how it is to be assessed, whereas the Programme Outcomes of the ENAEE Framework are specifying for accreditation agencies what should be assessed. Although there is some commonality of wording of Programme Outcomes and Learning Outcomes they have different purposes, and therefore it was thought useful to retain different terms in order to clarify the distinction.

2.4 The first steps of the Label Committee

(by Denis McGrath)

The EUR-ACE® Label Committee (LC) was established by the Administrative Council (AC) of ENAEE on the 13th June 2006. It held its first meeting on the 6th September 2006.

The Terms of Reference of the LC required it to,

- Evaluate applicant agencies for compliance with the EUR-ACE® standards so that a recommendation to authorise agencies to award the EUR-ACE® label could be made to the AC,
- Assist the development of accreditation agencies in countries where no such agencies exist.

Each authorised agency was invited to nominate a representative to the LC. Each nominee was required to fulfil the following membership criteria,

- Hold an engineering or engineering related qualification,
- Be fluent in English,
- Have extensive experience as an evaluator on audit teams for engineering degree programmes,
- Be professionally active in a professional or academic engineering organisation.

The founding agencies were,

- ASIIN, Germany,
- CTI, France,
- Engineering Council, UK,
- Engineers Ireland,
- Order of Engineers, Portugal,
- AEER, Russia.

Using the then EUR-ACE® standards, these agencies were evaluated over a six-month period from September 2006 and the first EUR-ACE® labels were awarded.

The Label Committee also developed the procedure for evaluating applicant agencies and the necessary explanatory documents. The procedure was explained in Standards and Guidelines for Accreditation Agencies including the information about the agency to be provided in the Application Form for Accreditation Agencies, the documentation of the agency's standards and procedures, and the arrangements for the observations of programme evaluation by the agency. The assessment of an applicant agency by The Review Team appointed by the Label Committee to assess an applicant agency reported to the Committee using a pro forma document Report to EUR-ACE® Label Committee. In addition the Label Committee detailed the administrative process to be followed in evaluating an application in Procedure for Evaluating Applications for Agencies. The current version of the all documents regarding the authorization process can be reached from www.enaee.eu, under the menu EUR-ACE® System/EUR-ACE® Label Authorisation Process.

Additional agencies were later authorised as follows,

- MÜDEK, Turkey, 21.01.2009,
- ARACIS, Romania, 13.09.2012,
- QUACING, Italy, 13.09.2012,
- KAUT, Poland, 16.09.2013,
- AAQ, Switzerland, 19.11.2014,
- FINEEC, Finland, 19.11.2014,
- ANECA/IIE, Spain, 19.11.2014.
- ZSVTS, Slovakia, 20.06.2017

All engineering degree programmes which were awarded the EUR-ACE® label were listed on the ENAEE Database of EUR-ACE® Labelled Programmes. This database provided the formal authentication of each programme having been awarded the EUR-ACE® label.

Programme Type	Number
First Cycle Degree	1123 (45%)
Second Cycle Degree	769 (31%)
Second Cycle Integrated	616 (24%)
TOTAL	2508 (100%)

TABLE: Distribution of Programme Types in the ENAEE Database, (December 2016)

2.5 The EUR-ACE® - IMPLEMENTATION project (2006–2008)

(by Claudio Borri and Giuliano Augusti)

In November 2006, ENAEE assessed that the six Accreditation Agencies (namely, Engineering Council-UK, Engineers Ireland (IEI); Order of Engineers/Ordem dos Engenheiros, Portugal; CTI, France; ASIIN, Germany; RAEE, Russia) that had been active partners of the EUR-ACE® project and in February had contributed to the foundation of the ENAEE network, fully complied with the requirements set by the EUR-ACE® Framework Standards; hence, they were authorized to award the EUR-ACE® label for a period of two years.

Two EC-supported projects (EUR-ACE® IMPLEMENTATION and PRO-EAST) were active between 2006 and 2008, and greatly helped to start up the EUR-ACE® system, respectively in the EU and in Russia. EUR-ACE® IMPLEMENTATION is summarized in this section, PRO-EAST in the following section 2.6.

EUR-ACE® IMPLEMENTATION started formally in Brussels on 7 September 2006 with the first meeting of the "Project Board", composed by the "contact persons" of the following 20 partner Institutions:

1. UNIFI (IT)
2. ENAEE (BE)
3. FEANI (BE)
4. SEFI (BE)
5. EUROCADRES (BE)
6. EUA (BE)
7. IDA (DK) (Ingeniørforeningen I Danmark/

The Danish Society of Engineers)

8. ASIIN (DE)
9. AUA (GR) (Agricultural University of Athens)
10. CTI (FR)
11. IEI/Engineers Ireland (IR)
12. CoPI (IT) (Conferenza dei Presidi delle Facoltà di Ingegneria Italiana)
13. CRUI (IT) (Conferenza dei Rettori delle Università Italiane)
14. NVAO (NL)
15. OE-PT (PT)
16. EC-UK (UK)
17. UAICR (RO)
18. MÜDEK (TR) (Association for Evaluation and Accreditation of Engineering Education)
19. RAEE (RU)
20. BBT (CH)

The EUR-ACE® Project Board, responsible for the general management of the project and the approval of the final outputs, held six "physical" meetings and was consulted by e-mail whenever necessary.

In its 6th and last meeting (28 August 2008) the Project Board approved the technical and financial implementation reports and the project outputs, entrusting the Coordinator and the Secretariat for final editing.

In accord with the aims and objectives already stated in the application, the most significant results of EUR-ACE® IMPLEMENTATION were the definition and the initial successful implementation of the EUR-ACE® accreditation system of engineering programmes, proposed by the previous EUR-ACE® project (2004-2006), i.e. a decentralised system in which national bodies accredit the programmes and award a common quality label (the EUR-ACE® label) to the accredited programmes.

After the initial authorization to award the EUR-ACE® label for a period of two years, the six Agencies underwent a new assessment that was positively concluded before the two year elapsed.

Approximately 100 EUR-ACE® labels were awarded already in 2007, first year of operation, notwithstanding the late start and some remaining difficulties of several types: it is worth underlining that the six countries of this initial "core" of the EUR-ACE® system cover a variety of educational, political and social realities throughout Europe, such to constitute a significant sample of the EHEA countries.

In accord with the European Qualification Framework and other documents of the “Bologna Process”, the awarded EUR-ACE® labels distinguished between “First Cycle” and “Second Cycle” degrees: the initial idea of denoting the degrees respectively “EUR-ACE® Bachelor” (European Accredited Engineering Bachelor) and “EUR-ACE® Master” (European Accredited Engineering Master) was initially discarded, because of the misunderstandings generated by the very different meanings still attributed to the terms “Bachelor” and “Master” in the EHEA countries (but was introduced later).

The six Agencies initially participating in the EUR-ACE® system were all Agencies specialized in accrediting engineering programmes: in view of the successive enlargement of the system, an objective of EUR-ACE® IMPLEMENTATION was to investigate whether a “general” QA/Accreditation Agency could join the EUR-ACE® system for what attains to accreditation of engineering programmes. To test this possibility on a concrete example, contacts and discussions were developed throughout the project lifetime with the Accreditation Organisation of The Netherlands and Flanders (Nederlands-Vlaamse Accreditatieorganisatie NVAO), the only body legally authorized to accredit HE programmes in the Netherlands and Flanders, and a partner of the project: unfortunately, these contacts did not lead to any solution, mainly because of the different legal systems of the two concerned countries (Netherlands and Belgium); the question was overcome only in later years (e.g., see section 3.4.5 about the Spanish agency ANECA).

A main objective of the project was also to set-up a viable and self-supporting organization able to maintain and develop the EUR-ACE® system in successive years: it was confirmed that this could be the “European Network for Accreditation of Engineering Education” (ENAAEE), an international non-profit Association funded on 8 February 2006 as the development of the earlier “European Standing Observatory for the Engineering Profession and Education” (ESOEPE). ENAAEE was a partner Institution of EUR-ACE® IMPLEMENTATION and was already monitoring and supervising the EUR-ACE® system. During the EUR-ACE® IMPLEMENTATION lifetime, three more members joined the 14 founding members of ENAAEE, namely:

- MÜDEK, a partner of the project as Turkish “Engineering Evaluation Board”, transformed during the project lifetime into the registered “Association for Evaluation and Accreditation of Engineering Programs” (Mühendislik Eğitim Programlari Degerlendirme ve Akreditasyon Dernegi), and a few months later became the seventh Agency authorized to award the EUR-ACE® label;
- CLAIU (Council of Associations of Long-Cycle Engineers of a University or Higher School of Engineering of the European Union);
- IGIP (Internationale Gesellschaft für Ingenieurpädagogik; International Society for Engineering Education).

During EUR-ACE® IMPLEMENTATION, the EUR-ACE® system has taken advantage of a fee system: each accredited Agency paid an annual fee, and a “label fee” was collected for each awarded EUR-ACE®



RAEE Authorisation, Moscow, 27.03.2007
Giuliano Augusti, Oleg Boev



EUR-ACE Implementation Project Board Meeting,
Thessaloniki, 28.08.2008

label. However, the largest source of financing of EUR-ACE® IMPLEMENTATION was the self-financing by the partners, while the EU grant contributed to make ends meet, as stated in the Financial Report of the project; the project elaborated also a proposal for a self-supporting budget of the EUR-ACE® system for the successive years.

In conclusion, it appears fair to state that a permanent and viable system for European

accreditation of engineering programmes, already tested and applied in a number of cases, has been set up during the two years of the EUR-ACE® IMPLEMENTATION project: the aims of the project have thus been satisfactorily achieved notwithstanding that the drastic reduction of financing with respect to the original grant application, that forced to readjust some of the aspects of the original project.



RAEE workshop for experts in evaluation of programme quality, La Sapienza, Rome, 11.05.2007

2.6 PRO-EAST: Promotion and Implementation of EUR-ACE® Standards

(by Giuliano Augusti)

In parallel with EUR-ACE® IMPLEMENTATION, a project dedicated to Russia was run under the TEMPUS-Tacis programme, namely PRO-EAST: PROMOTION AND IMPLEMENTATION OF EUR-ACE® STANDARDS.

The following six partners participated in the project:

1. UNIFI (Università degli Studi di Firenze, IT)
2. RAEE (Russian Association of Engineering Education, RU)⁴⁴
3. TPU (Tomsk Polytechnic University, RU)
4. FEANI (Fédération Européenne d'Associations Nationales d'Ingénieurs, BE)
5. SEFI (Société Européenne pour la Formation d'Ingénieurs, BE)
6. CoPI (Conferenza dei Presidi delle Facoltà di Ingegneria Italiane, IT)

The main aims of the project, that held a Workshop in Rome in May 2007 and was closed by a final Seminar in Moscow on 21 November 2007, were:

- Dissemination of the EUR-ACE® results
- Award of the first EUR-ACE® labels in Russia

Both aims were achieved: 11 labels were awarded by RAEE on a total of approximately 120 EUR-ACE® labels awarded at the end of 2008.

44 Now AEER: Association for Engineering Education of Russia

Chapter 3

DEVELOPMENTS AND PROGRESSIVE BUILDING OF TRUST (2008–2016)

It was always recognised that the value of the EUR-ACE® Label would be enhanced by increasing the number of authorised agencies and therefore, when the standards and procedures of ENAEE had been fully established and tested, agencies within the European Higher Education Area were encouraged to apply for authorisation. In particular the EUR-ACE® Spread Project, funded by the European Commission, supported mentoring with agencies in a number of different countries. The following summaries of the process of authorisation of some agencies illustrate the flexibility of the ENAEE procedures to accommodate diverse methods and traditions while maintaining standards.

3.1 The EUR-ACE® Spread project (2008–2010) and the extension of the system

(by Iacint Manoliu)

ENAEE was committed not only to strengthen the EUR-ACE® system into the six countries constituting the initial core, but also to spread it into other countries of the European Higher Education Area. Between 1st November 2008 and 31st October 2010 ENAEE developed and coordinated another EU-supported project called EUR-ACE® SPREAD, targeted mainly to Turkey, Romania, Lithuania, Italy and Switzerland. The EUR-ACE® SPREAD project gave to ENAEE the opportunity to develop a very efficient system of counselling the agencies seeking the authorization to award EUR-ACE® label, by nominating mentors.

The first concrete achievement of EUR-ACE® SPREAD was the formal addition of the Turkish “Association for Evaluation and Accreditation of engineering programs” (MÜDEK) to the six initial agencies authorized to award EUR-ACE® label. MUDEK had begun accrediting programmes on behalf of the Turkish Engineering Deans Council in 2003, joined ENAEE in 2006 and became an independent association in 2007. MUDEK applied on 25 January 2008 to be authorised to award the

EUR-ACE® label to First Cycle programmes. After assessment of the application and observation visits by an ENAEE review team, following the procedure described in Section 2.4, MÜDEK became the seventh Agency authorized to award EUR-ACE® label on 25 January 2009.

ARACIS, the Romanian Agency for Quality Assurance in Higher Education, was also a partner in the EUR-ACE® SPREAD project. ARACIS was founded in 2006, as an independent agency and autonomous public institution of national interest. ARACIS is a general agency, i.e. covering all fields of higher education, and accreditation of engineering programmes is based on general standards, common to the entire higher education system, in addition to the specific standards established by two Engineering Sciences Commissions. After a mentoring phase which was performed as a part of the EUR-ACE® SPREAD activities, ARACIS submitted an application to ENAEE for authorisation in 21 October 2010, and were authorised to deliver EUR-ACE® labels on 13 September 2012^{45,46}.

At the same meeting, the ENAEE Administrative Council authorized the Italian agency QUACING to deliver for three years the EUR-ACE® Label. QUACING (Agency for Quality Certification and EUR-ACE® Accreditation of Study Programmes in Engineering), was founded on 13 December 2010 and immediately applied to ENAEE for the authorization. The period of validity of the initial authorization given to QUACING by ENAEE was limited to three years because QUACING had not yet obtained a formal recognition by the

45 Manoliu I. (2011): Implementation in Romania of the European Framework Standards for the Accreditation of Engineering Programmes, Quality Assurance Review, vol.3, nr.1, April 2011.

46 Manoliu I. (2011): Implementation of the EUR-ACE® system in Romania: opportunities and benefit for engineering education, Journal of the European Higher Education Area, No.3/2011.

official “Agenzia Nazionale per l’Accreditamento del Sistema Universitario e della Ricerca” ANVUR (National Agency for the Accreditation of University System and Research).

SKVC (Studijų Kokybės Vertinimo Centras-Centre For Quality Assessment In Higher Education) is an independent public agency founded by the Ministry of Education and Science of the Republic of Lithuania and implements the external quality assurance policy in higher education in Lithuania. SKVC was provided with mentoring within the EUR-ACE® SPREAD Project and submitted an application on 19 July 2010 for authorization to deliver EUR-ACE® labels. Later on, during the authorisation review period, SKVC decided to withdraw its application for authorisation.

The Swiss Agency of Accreditation and Quality Assurance (AAQ) is a public agency of general type (for all fields of higher education) and submitted an application to ENAEE for authorization on 15 October 2010. It was authorised to award the EUR-ACE® Label on 19 November 2014.

As interest grew in the value of EUR-ACE® accreditation three further agencies applied for authorisation. KAUT (Komisja Akredytacyjna Uczelni Technicznych - Accreditation Commission of Universities of Technology), a Polish public agency specialized in engineering which was founded in 2001, submitted to ENAEE the application to get the authorization to award the EUR-ACE® label in 2010. The authorization was awarded for the first cycle degree programmes in September 2013 and for the second cycle degree programmes in September 2015.

ANECA (Agencia Nacional de Evaluación de la Calidad y Acreditación - National Agency for Quality Assessment and Accreditation) is a public Foundation created on 19th July 2002 by the Ministry of Education, Culture and Sport, functioning as a comprehensive accreditation agency having as a main responsibility to evaluate and perform accreditation of study programmes in all professional areas at all levels (Bachelor, Master and PhD). In July 2013, ANECA and IIE (Institute of Engineering of Spain) signed an agreement for collaboration in developing the quality assessment of engineering programmes, focused mainly in the promotion of the EUR-ACE® quality label in Spain. IIE

is the main representative body of the engineering profession in Spain. On July 30th 2013, ANECA, together with IIE, applied for the authorization to award EUR-ACE® label for engineering programmes meeting ENAEE’s standards, and were authorised to do so on 19 November 2014.

FINEEC (Finnish Education Evaluation Centre), formerly FINHEEC (Finnish Higher Education Evaluation Council) was founded in 2014 (the former organization was founded in 1995). FINHEEC submitted an application to ENAEE in 2013, and after a mentoring phase, were authorised to award EUR-ACE® labels on 19 November 2014.

3.2 Benchmarking the EAFSG with others

(by Ian Freeston)

One of the outcomes of the EUR-ACE® Spread project (see Section 3.1) was ‘Revision of EUR-ACE® Framework Standards and other procedures and documents’. As ENAEE is an organisation which is directly concerned with the quality of engineering education, it is essential that its requirements and procedures are compliant with the generic statements of international standards of education. Consequently within the EUR-ACE® Spread project ENAEE undertook an evaluation of its standards against the specific statements of the following organisations:

- Standards and Guidelines for Quality Assurance in the European Higher Education Area (usually referred to as ESG), published by ENQA in 2009.
- Guideline of Good Practice in Quality Assurance published by INQAAHE in 2007.
- Code of Good Practice for the Members of the European Consortium for Accreditation in Higher Education published by ECA in 2004.

In addition, the ENAEE standards were compared to those of general accreditation agencies, that is those agencies which assessed all subjects and not just engineering, and also with the Tuning-AHELO framework of learning outcome in engineering.

The outcome of these reviews⁴⁷ were that the standards and procedures of the ENAEE Framework were at least substantially equivalent to those of the three external quality assurance agencies. The review also made six recommendations for enhancing the ENAEE procedures and documentation.

Another review of the standards of EAFS was carried out within Line C of the EUGENE project (European and Global Engineering Education, 2009 to 2012). The main goal of the EUGENE project was to improve the impact of European engineering education on global competitiveness, innovation and socio-economic growth, and Line C was specifically aimed at improving the transnational mobility of engineering students, graduates and professionals. Line C was led by ENAEE (Giuliano Augusti, Iring Wasser, Sebastião Foyo de Azevedo, Denis McGrath, Ian Freeston) and SEFI (Günter Heitmann). The standards of

The main conclusions of the review of standards were:

- the structural differences in the expression of the standards in the two systems did not prevent a preliminary comparison;
- there was considerable agreement in the content of the standards;
- exact comparison of level in the two systems was limited by differences in structure and terminology;
- there was sufficient commonality in the two systems to suggest that discussions between ENAEE and IEA of the differences could be constructive.
- Subsequent discussions between ENAEE and IEA have led to a joint publication on accreditation best practice, described in Section 3.6.2 below.



EUR-ACE® Accord signing ceremony, Brussels, 24.11.2014



EAFS were compared with the statements of standards of the Washington and Sydney Accords of the International Engineering Alliance (IEA). An important preliminary outcome was that a common glossary was developed with IEA, and this is described in section 3.6.1 below. The full report (Comparison of the EUR-ACE® Standards and the requirements of the Washington and Sydney Accords)⁴⁸ formed part of the final EUGENE report.

3.3 The EUR-ACE® accord (by Denis McGrath)

At the time of the establishment of ENAEE it was always hoped that ultimately all authorised agencies would engage in a mutual accreditation agreement similar to other international agreements on engineering programme accreditation, such as the Washington Accord.

On the 19th November 2014, following extensive discussions, the then 13 authorised agencies signed

47 Details are given in EUR-ACE® SPREAD WP 9: Revision of EUR-ACE® Framework Standards and other procedures and documents, EafsReviewV4. 21 June 2010. This document is provided in the ENAEE e-book repository.

48 Comparison of the EUR-ACE® Standards and the requirements of the Washington and Sydney accords, EUGENE deliverable no. 26, 2012. This document is available in ENAEE e-book repository

a mutual recognition agreement whereby they accept each other's accreditation decisions in respect of engineering degree programmes at Bachelor and Master degree levels which they accredit and which have been awarded the EUR-ACE® label.

Furthermore, it was decided that, in future, all newly authorised agencies would be obliged to sign up to the EUR-ACE® Accord.

It is hoped that the EUR-ACE® Accord⁴⁹ will facilitate the mobility of engineering graduates throughout the European Higher Education Area, as well as the establishment of a Common Training Framework for the engineering profession.

3.4 The value added by EUR-ACE®: Testimony of some authorised agencies

3.4.1 Testimony of CTI (by Bernard Remaud)

Commission des titres d'ingénieur (CTI) is one of the oldest accreditation agencies; it was established in France, in 1934, initially to assess the quality of the French private institutions of engineering education. In 1984, its missions were extended to every French engineering higher education institutions.

CTI has a very wide autonomy to define and enforce its standards for engineering education; from its creation, the commission is based on the parity between representatives of academia and of the socio-economical world: it is composed of 16 representatives of engineering education, 8 representatives of employers and 8 of engineers associations and trade-unions. Its main characteristics are the following:

- In France, the engineer profession is not regulated, but the "titre d'ingénieur diplômé" (Master degree) is protected by the law; only the programmes assessed by CTI may deliver

this title; CTI takes the decision for the private institutions, the ministry formally makes it upon CTI's proposal for public institutions (which always follows the CTI proposition).

- The accreditation length and the evaluations periodicity were stated in 1996; it was related to the publication of CTI's first standards and guidelines. The evaluation periodicity of all the programmes of an institution are aligned, which gives the audit visits a strong institutional component.
- Evaluation panels are composed of 2 CTI members (academic and socio-economic) backed by experts (field, international, students ...), who are specially selected and trained.
- The 1934 law entitles CTI to operate abroad and to authorize foreign institutions to deliver the "titre d'ingénieur diplômé" under the same conditions as in France.
- CTI is member of ENQA and is listed in the European Quality Assurance Register (EQAR).

Every year, around 37 000 engineers graduate from about 200 French engineering schools.

As detailed in the preceding sections, CTI is one of the founding institutions of ENAEE and of the EUR-ACE® system. CTI brought its strong experience in education assessment, its concern about the involvement of professionals and the emphasis on soft skills for engineering education.

Linking CTI's standards to ENAEE's EAFSG was then quite natural, particularly since CTI's requirements surpass those of ENAEE for work-based training, international mobility and languages fluency. For French institutions, EUR-ACE® label awarding procedure is included in the mandatory accreditation process. The Commission takes two separate decisions based on the panel report: one for the national accreditation and one for the EUR-ACE® label (then it is up to the institution to request the formal attribution). Most of the time the programmes which obtain the maximal accreditation length can request the label. Usually, the programmes which are fully accredited (without reservations) obtain the EUR-ACE® label.

Beyond the procedural aspects, the EUR-ACE® system encouraged CTI's mutation from a content-

⁴⁹ The EUR-ACE® Accord can be accessed from <http://www.enaee.eu/wp-assets-enaee/uploads/2016/06/EAA-MRA-agreement-A3-signed.pdf> and is also available in ENAEE e-book repository.

based accreditation (mainly due to its long history) to an outcome-based approach⁵⁰.

Since 2016, CTI's standards and guidelines include a first translation of EAFSG's outcomes; in 2017, AAQ and CTI jointly published a French translation of the full document.

In its annual survey to the institutions, CTI asked 2 questions about EUR-ACE[®]:

- "What is the interest of your institution in the EUR-ACE[®] labelling system?": on a scale (strong, fair, none), 51% of the institutions answered "strong", 42% "fair".
- "What is the added value of the EUR-ACE[®] label to your international policy?": 35% answered "strong", 49% "fair".

A wide majority of the French engineering institutions consider that the EUR-ACE[®] system brings an added value to their international visibility. The number of requests from institutions is increasing, owing to the label growing awareness and the engineers demand in international mobility.

The Impact of EUR-ACE[®] on CTI trans-border activities is important; for foreign institutions within and beyond EHEA, the EUR-ACE[®] label has a strong added value, it demonstrates that their programmes fulfil the most demanding international criteria (while meeting the "French" requirements).

As an example, CTI, jointly with the Belgian agency AEQES, evaluated "ingénieur civil" and "ingénieur industriel" degree programmes of the French-speaking part of Belgium. Within the frame of ECA's MULTRA agreement with NVAO, CTI accredited the "civil engineer" degree programmes of the Flemish part of Belgium. In addition to the interest to get the external view of a foreign experienced agency, the possibility to obtain the EUR-ACE[®] label was clearly part of the Deans motivation to call for CTI's expertise⁵¹.

Considering the Bologna process and the future needs of the job market, there is an ongoing debate regarding the need for an engineering bachelor in the current landscape of technological degrees. Some engineering higher education institutions

have already taken different initiatives towards that direction in connection with industrial demand, public universities and IUT (Institutes of Technology) are making proposals for new curricula, in line or not of the EUR-ACE[®] standards.

Aware of the possible impact for engineering programmes and of the potential future accreditation needs, CTI keeps a constant and careful look upon these various initiatives.

3.4.2 Testimony of EngC (by David Cleland)

The Engineering Council was formed in 1981 to bring together the professional engineering institutions in the United Kingdom; some of these date back to 1800's. The primary purpose of the Engineering Council, as the UK regulatory body for the engineering profession, was (and is) to deliver public benefit in line with its Royal Charter. To meet this objective it maintains internationally recognised standards of competence and commitment for the engineering profession and holds the register of over 222,000 engineers and technicians who have been assessed against those standards. It licenses the professional engineering institutions to champion those standards, and to assess candidates for registration as Chartered Engineers, Incorporated Engineers, Engineering Technicians and ICT Technicians, for the deliverance of public benefit.

The key standards are the UK Standard for Professional Engineering Competence (UK-SPEC) and guidelines for the Accreditation of Higher Education Programmes (AHEP). UK-SPEC sets out the standards of competence and commitment which Chartered Engineers, Incorporated Engineers, Engineering Technicians and ICT Technicians must demonstrate to be recognised as qualified professionals. AHEP details the output standards against which educational programmes are assessed in order for graduates of the programme to be judged as meeting the educational part of professional qualification. These documents are updated regularly; the current versions were published in 2013 and 2014 respectively.

50 B. Remaud, European perspectives on the competences of engineering graduates, Engineering Education Journal, Dec 2013.

51 B. Remaud, Y. Berbers, A.M. Jolly and J. Nolland « Accreditation of Flemish Civil Engineers programmes (2016): an experience of cross-border Quality Assurance », 45th SEFI Annual Conference, September 2017, Azores Portugal.

The Engineering Council was one of the first registration bodies to adopt a competence-based approach to the assessment of the standard of engineers and engineering education. Therefore there is substantial experience with this approach in the UK. The Engineering Council, through the Professional Engineering Institutions, depends on a large cohort of volunteers to carry out the time consuming task of peer evaluation involved in programme accreditation and professional qualification review. With its long experience of competence-based assessment and outcomes-based accreditation of education programmes, the Engineering Council was well-placed to meet the ENAEE's Programme Outcomes listed in the EUR-ACE® Framework Standards and Guidelines document.

As well as maintaining the register of professionally qualified engineers and the list of accredited engineering degree programmes the Engineering Council works with government and industry to seek to address future manpower needs. Currently it is seeking to tackle an imminent engineering skills shortage. Engineering Council is working to ensure that no barriers exist to anyone appropriately qualified becoming professionally registered, by championing programmes that promote diversity and inclusion across the profession.

The Engineering Council is an active member of international agreements and networks; a founding member of ENAEE. This enables it to benchmark UK standards against international standards and to have influence internationally, as well as supporting the international mobility of professionally qualified/registered engineers and technicians.

3.4.3 Testimony of MÜDEK (Ramazan Yildirim and Erbil Payzin)

Background information on MÜDEK⁵²

Association for Evaluation and Accreditation of Engineering Programs (MÜDEK), is a non-governmental organization operating for the purpose of contributing to the enhancement of quality of engineering education in Turkey by

means of the accreditation and evaluation of and providing information services for engineering education programs in different disciplines. It evaluates and accredits engineering programs in Turkey and Northern Cyprus using outcomes-based accreditation criteria and is totally financed through the fees paid by these HEI's applying for accreditation.

MÜDEK was initially established in 2002 by the Engineering Deans Council of Turkey as an independent, non-governmental platform with the name Engineering Evaluation. It became an association in 2007 and changed its name to Association for Evaluation and Accreditation of Engineering Programs. Except MÜDEK administrative staff, individuals participate in MÜDEK boards, committees, working groups, and accreditation evaluation activities on a voluntary basis without any pay.

MÜDEK has been authorised by Higher Education Council of Turkey (2007, 2013), authorised by ENAEE to deliver the EUR-ACE® (Bachelor) Label (2009, 2013) and is a Washington Accord Signatory (2011).

Impact of ENAEE and EUR-ACE® on MÜDEK

MÜDEK became a ENAEE Member in 2006 and partnered in the EUR-ACE® Implementation⁵³ and EUR-ACE® SPREAD⁵⁴ projects. These activities provided MÜDEK the opportunity for networking and benchmarking with other accreditation agencies. MÜDEK applied to be authorised to deliver the EUR-ACE® Label in 2008. Preparing for this application provided MÜDEK an opportunity for self-assessment and for improving its procedures and evaluation criteria.

MÜDEK was authorised by ENAEE in 29.01.2009 to deliver the EUR-ACE® (Bachelor) Label. This provided international recognition to MÜDEK accredited programmes. As of 2016, MÜDEK has delivered 258 EUR-ACE® (Bachelor) Labels to 4 year engineering programmes that it accredited in Turkey and Northern Cyprus.

MÜDEK has a representative on the EUR-ACE® Label Committee (2009-...) and had members serving in the ENAEE Administrative Council (2009-

⁵² More information on MÜDEK is available from <http://www.mudek.org.tr/en/>

⁵³ See Section 2.4 for EUR-ACE® Implementation project details.

⁵⁴ See Section 3.1 for EUR-ACE® SPREAD project details.

2014, 2016-...). MÜDEK representatives actively participated in various working groups set up by ENAEE such as for revision of ENAEE Charter and Bylaws, revision of EUR-ACE® Framework Standards (EAFS), Mutual Recognition Agreement and ENAEE-IEA Collaboration. They also served as Review Team members set up by ENAEE for authorisation or re-authorisation of various accreditation agencies. All these activities provided valuable benchmarking and learning opportunities to MÜDEK on QA practices in EHEA and also provided means to share its own experiences with other accreditation agencies.

3.4.4 Testimony of KAUT (by Bohdan Macukow)

The Accreditation Commission of [Polish] Universities of Technology (KAUT) was established in 2001 by the Conference of Rectors of Polish Universities of Technology (KRPUT) under the *Memorandum of Understanding of Rectors of Universities of Technology on the Quality of the Teaching and Learning Process*. KAUT is the organisation responsible for the accreditation of engineering programmes, and functions in addition to the obligatory state controlled accreditation of all higher education.

KAUT has several domains of activity: improving the quality of education; drawing up clear procedures for assessing the learning conditions, teaching methods and study programmes; creation of conditions facilitating national and international exchange of students and staff; and promoting engineering degree programmes that meet high standards of quality. The aims of these activities are implemented by the accreditation of educational programmes in engineering and technology, assisting higher education institutions in the implementation of internal quality assurance systems, promoting "best practice" examples, and supporting students national exchange programmes.

In September 2013, KAUT has been authorised by ENAEE to confer, along with standard KAUT accreditation, the European EUR-ACE® Label certificate. In November 2016 KAUT application for the membership of ENAEE was accepted. The aims and purposes of KAUT have been considerably strengthened by the authorisation to award the EUR-ACE® label.

At present of 53 accredited engineering programs (27 BSc and 26 MSc) 47 have been awarded EUR-ACE® Labels. To reinforce the importance of engineering accreditation, KAUT has signed an agreement with the *Perspektywy* ranking organization to enable the results of KAUT accreditations to be included in their ranking. In 2013 KAUT signed an agreement with the Polish Chamber of Civil Engineers to develop common requirements and accreditation standards for the civil engineering degree programme, which will help graduates to obtain professional qualifications in the future.

3.4.5 Testimony of ANECA (by Guillermo Calleja)

Added value of the EUR-ACE® label to the National Agency for Quality Assessment and Accreditation of Spain (ANECA in its Spanish acronym)

In 2013, the National Agency for Quality Assessment and Accreditation of Spain, in order to launch the first wave of national accreditations, decided to offer Spanish universities the possibility of obtaining the EUR-ACE® label in the same process of accreditation. To this end, a collaboration was established between ANECA, as the main actor in the national accreditation process, with the Spanish Institute of Engineering (IIE in its Spanish acronym), as one of the most representative institutions of the country's Engineering profession. In the same year, both organizations, in collaboration, applied to ENAEE for authorization as an agency capable of awarding the EUR-ACE® label to Spanish degrees, obtaining a favourable result on June 19, 2014.

So far 108 Spanish degrees have applied for the evaluation of the EUR-ACE® label, with a successful result in 81 of them.

The added value provided by these evaluations to ANECA is, on the one hand, to offer a differentiating value to the agency with respect to the other regional accreditation agencies when managing a high quality evaluation, as well as in enhancing the quality of the engineering academic system year by year by ensuring that EUR-ACE® accredited degrees meet European and international standards recognized by employers in Europe, thus facilitating the mobility of graduates as promoted

in the European Union Directive on recognition of professional qualification. On the other hand, this European recognition has allowed ANECA and the IIE to begin accreditation processes in foreign universities, especially in Latin America⁵⁵.

All this has led to the fact that we currently have a high demand for applications for the EUR-ACE® label from Spanish degrees (more than 200 applications for the next two years) and predictably also in countries of Latin territory, which proves that the EUR-ACE® label is an additional certification of the high quality of the degree that meets the quality requirements set by the profession.

3.5 The revised EAFSG

(by Alfredo Squarzoni)

The main reasons for the review of the first standards and guidelines were:

- a. The opportunity to include Student Workload Requirements.
- b. The opportunity to reorganize and update the Programme Outcomes.
- c. The necessity to consider the revised *Standards and Guidelines for Quality Assurance in the European Higher Education Area* (ESG). The review of the EAFSG was approved in March 2015 while the new ESG were adopted in May 2015, but they were already known when the review started.
- d. The opportunity to collect in only one document all ENAEE standards.

a) The Student Workload Requirements are described in Section 2.2 of the *EUR-ACE® Framework Standards and Guidelines* (EAFSG). They are fully compliant with the overarching *Framework of Qualifications for the European Higher Education Area* (EQF), adopted by the Bergen Conference of European Ministers responsible for Higher Education on 19-20 May 2005.

b) In the first *EUR-ACE® Framework Standards for Accreditation of Engineering Programmes* (EAFS) Second Cycle Programme Outcomes included also First Cycle ones. In the EAFSG Master Programme

Outcomes are defined without any reference to the Bachelor ones.

The Programme Outcomes corresponding to Dublin Descriptors 1 and 2 have been reformulated in order to clarify the competences required to Bachelor and Master graduates, mainly through a better definition of the typologies of problems they are expected to be able to deal with:

- **At Bachelor level**, ‘complex problems’ are problems that require
 - knowledge and understanding of mathematics, sciences and engineering disciplines underlying engineering specialisation, and/or
 - knowledge and understanding that support activities of analysing, designing, investigation, and/or
 - knowledge and understanding of engineering practice,
- **At Master level**, complex problems may be new or unfamiliar, involve considerations from outside the field of study, incompletely defined and /or conflicting issues and non-technical constraints, and require original/innovative thinking.

The transferable Programme Outcomes previously included in only one learning area have been split in three learning areas, corresponding to Dublin Descriptors 3, 4 and 5, and better specified.

c) Compared to the first (2009) version of ESG, the main changes (and improvements) introduced by the revised (2014) version ESG are:

- a new standard (1.3) on ‘Student-centred learning and teaching’, associated to the previous standard on ‘Assessment of students’;
- a new standard (1.4) on ‘Student admission, progression, recognition and certification’;
- a new standard (1.9) on ‘On-going monitoring and periodic review of programmes’ that underlines the importance of the periodic review of programmes, previously considered in Standard 1.2 together with the approval of programmes and awards; and
- the introduction of a standard (1.10) on ‘Cyclical external quality assurance’.

⁵⁵ So far 6 Mexican degrees of 3 universities have applied for the evaluation of the EUR-ACE® label, with a favorable result in the 6 cases.

Section 2.2 - Programme Management of the EAFSG, which replaces Section 2 - Criteria and Requirements for Programme Assessment and Programme Accreditation of the EAFS, includes all the changes introduced by the new ESG.

d) Before the revision, the ENAEE standards were defined in two documents:

- EUR-ACE® Framework Standards for Accreditation of Engineering programmes,
- ENAEE Standards and Guidelines for Accreditation Agencies.

Now the Standards and Guidelines for Accreditation Agencies are described in Section 3 of the unified EAFSG⁵⁶. Only minor adjustments have been introduced in the text with respect to the first version.

3.6 Collaboration with other umbrella QA organisations

3.6.1 Development of a common glossary of terms with IEA

(by Günter Heitmann)

From almost the beginning of the ENAEE the collaboration with the Washington Accord (WA) and its umbrella organisation International Engineering Alliance (IEA) was on the agenda of ENAEE. The ultimate aim was and still is the mutual recognition of accreditation decisions leading to the EUR-ACE® labels and respective ones leading to IEA signatories' labels, in particular the engineering label of the Washington Accord members. A mutual recognition agreement will most probably be based on the substantial equivalence of programme outcomes and the trust in the quality and sustainability of the accreditation procedures. As a first step into the comparison of the required programme outcomes of the EUR-ACE® labels and respectively the graduate attributes of the IEA qualifications it was felt necessary to arrive on a common understanding of the terms used in

the different frameworks and to arrive at a shared glossary of terms. References have been the glossaries in use by IEA and ENAEE.

The IEA in 2009 attached a glossary to the second version of its document "Graduate Attributes and Professional Competencies". ENAEE relied on the quite comprehensive glossary of the Thematic Network TREE, finalised in 2008, which was a revised version of a glossary developed in the Network E4 (see paragraph 1.4), starting already in 2003. Embedded in the new Network EUGENE (European and Global Engineering Education a Glossary Working Group for the European side of the IEA/ENAEE collaboration was constituted, chaired by Günter Heitmann from SEFI, who had been already in charge of the E4 and later the TREE glossary activities. A respective group was formed in the IEA with Hu Hanrahan as the chair and main contributor to the process. The main activities took place in 2010 and 2011, based on outstanding in-puts of Ian Freeston from EC UK and Hu Hanrahan. Active contributors on the ENAEE side have been also Teresa Sanchez, Giuliano Augusti, Erbil Payzin, Denis McGrath, Iacint Manoliu and Jean-Claude Arditti. The work undertaken was based on identifying the words in the EUR-ACE® Framework Standards (abbreviated here to EAFS) that need to be clearly understood by whoever uses the framework either to develop or to evaluate a programme. This procedure was then applied to the stated requirements of the Washington Accord (abbreviated to WA).

By the end of the EUGENE project in September 2012 the "EUGENE proposal for a jointly agreed IEA/ENAEE Glossary of Terminology" was delivered. The proposal has been adopted by ENAEE and later applied to the revision of the EAFS, in its actual version abbreviated EAFSG. It still functions as a reference to current activities of ENAEE and its members. It is published on the ENAEE web site under documents. The IEA used it for a respective revision of their glossary⁵⁷.

The ENAEE/IEA collaboration continued with the discussion about the procedures and best practice in accreditation of engineering programmes.

⁵⁶ The current version of EAFSG can be accessed from www.enaee.eu and is also available in the ENAEE e-book repository.

⁵⁷ IEA Accords - Rules and Procedures (3 June 2006), downloadable from www.ieagrements.org/about-us/key-documents/

3.6.2 Best Practice in Accreditation of Engineering Programmes

(by Timur Dogu)

A document on “Best Practice in Accreditation of Engineering Programmes” was jointly adopted and published on 23 June 2015 in Istanbul, by the European Network for Accreditation of Engineering Education (ENAAEE) and the constituent educational accords (Washington Accord, Sydney Accord and Dublin Accord) within the International Engineering Alliance (IEA)^{58,59}. ENAAEE and the IEA Accords are



Approval of “Best Practice” document at IEA-ENAAEE forum in Istanbul 23 June 2015 (Hu Hanrahan for IEA and Bernard Remaud for ENAAEE)

committed to best practice in the accreditation of engineering programmes and have given effect to this commitment through the joint development of this document. The document was set up as a guideline for a common general understanding of best practice principles and procedures. It serves both ENAAEE and IEA in their on-going operations and is of interest to bodies either forming new agencies or developing accreditation systems to the level required by either EUR-ACE[®] or the IEA Accords. This best practice agreement has been adopted by the agencies which were authorized to award the EUR-ACE[®] Label in 13 countries in the European Higher Education Area (Finland, France, Germany, Ireland, Italy, Poland, Portugal, Romania, Russia, Spain, Switzerland, Turkey, United Kingdom)

and 17 signatory agencies of IEA, from Australia, Canada, Chinese Taipei, Hong Kong China, India, Ireland, Japan, Korea, Malaysia, New Zealand, Russia, Singapore, South Africa, Sri Lanka, Turkey, United Kingdom and United States.

At the end of 2013, a joint ENAAEE/IEA working group (WG) was set up by I. Wasser, president of ENAAEE and H. Hanrahan, Chair of the Washington Accord, to work on the IEA-ENAAEE Co-operation Project. As of 2014-2015, the ENAAEE members of the WG were Jean-Claude Arditti, Timur Dogu, Denis McGrath and Bernard Remaud, while the IEA members of the WG were Robin King, Andrew Wo, David Holger and Hu Hanrahan. Draft of the best practice document was circulated among ENAAEE AC and LC members in February 2015, as well as IEA Accord members, to collect comments. This “Best Practice” document was then unanimously approved at the 36th ENAAEE AC meeting on 31 March 2015. The final version was then presented for approval/signature at a joint IEA/ENAAEE forum



Best Practice IEA/ENAAEE - presentation (Andrew Wo for IEA, Denis McGrath for ENAAEE) at the ENAAEE General Assembly meeting on 17 Nov 2015

in Istanbul on 23 June 2015. IEA-ENAAEE agreement on “Best Practice in Engineering Programme Accreditation” that had been developed by a joint WG and approved by the Boards of the two organizations in June 2015 was then presented by Messrs. A. Wo (for IEA) and D. McGrath (for ENAAEE) at the General Assembly meeting of ENAAEE on 17 November 2015⁶⁰.

58 <http://www.enaee.eu/engineering-accreditation/engineering-programme-accreditation/>

59 http://www.enaee.eu/wp-assets-enaee/uploads/2014/11/BestPractice_full_sept11.pdf

60 ENAAEE IEA Best Practice In Accreditation of Engineering Programmes: An Exemplar, 13 April 2015. This document can be downloaded from www.enaee.eu and is also available in the ENAAEE e-book repository.

This document was a significant achievement as it represented the agreement and common understanding of best practice in engineering accreditation by the 26 countries/accreditation agencies involved in the two organisations worldwide. Such peer review accreditation systems are in turn major contributors to the development of high-quality engineering education.

3.6.3 Collaboration with EASPA (by Erbil Payzin)

The European Alliance for Subject-Specific and Professional Accreditation and Quality Assurance (EASPA)⁶¹ is a non-profit association seeking to provide a platform for the cooperation between the European and international quality assurance networks and international organisations in the development and harmonisation of their activities in the field of quality assurance and quality improvement in higher education. It thus contributes towards the development and implementation of the European Higher Education Area. To this end, EASPA provides a collaborative forum for the community of disciplinary, field specific European networks of quality assurance that assess the quality of study programs, schools or professional individuals. It was founded on November 29, 2011 in Düsseldorf, Germany. ENAEE is a founding member of EASPA and Dr. Iring Wasser, past ENAEE President was instrumental in its foundation. Other members of EASPA are:

- European Quality Assurance Network for Informatics Education (EQANIE)
- Association Européenne des Conservatoires, Académies de Musique et Musikhochschulen (AEC)
- European Chemistry Thematics Network Association (ECTNA)
- International Food Association (IFA)
- European Network for Public Administration Accreditation (EAPAA)
- European Countries Biologists Association (ECBA)
- European Physical Society (EPS)

EASPA provides a platform for ENAEE to collaborate and share experience with other umbrella

organisations on subject specific programme accreditation in different fields.

3.7 QUEECA project (by Claudio Borri)

The main aim of TEMPUS project QUEECA (Quality of Engineering Education in Central Asia; N.530326-TEMPUS-1-2012-1-IT-TEMPUS-SMGR; 15 October 2012 - 14 April 2016) has been that of establishing and implementing a system of quality assurance (QA) of engineering education in the four main Central Asian (CA) countries Kazakhstan, Kirgizstan, Uzbekistan and Tajikistan). The system validates the accreditation of engineering programmes by the award of the EUR-ACE® quality label on the basis of the EUR-ACE® Framework Standards and related quality requirements and procedures. The project also takes advantage of experience in the EHEA (through ENAEE) and current efforts in Central Asia countries.

The ambitious overall goal shared by the four main Central Asian is to meet the quality standards of Higher Engineering Education of EU countries, and three years of intense activity by some leading Universities, together with Ministries of Education, has been directed towards the implementation of the Bologna process in the region (even if so far only Kazakhstan has joined the accord). At present there are two types of accreditation: an institutional one to assess the Higher Education Institutions (HEIs) organized by the Ministry of Education and Sciences and carried out by National Accreditation Centres; and a specialized one to assess the quality of individual subjects. The specialized accreditation is carried out by international accreditation agencies or accreditation organizations created by (or strongly connected with) professional associations. The CA governments are interested in creating and developing internationally recognized systems of educational and professional qualifications, and in particular, the creation of accreditation organizations belonging to international networks was considered an urgent need.

Kazakhstan and the other CA countries have declared their priority interest in the implementation

61 <http://www.easpa.eu/>

of their Engineering and Technology programmes to conform to the European Qualification Frameworks (EQF). However, international recognition of qualifications and programmes requires the periodic evaluation of study programmes by both internal QA and peer review processes. The assessment standards and procedures of the EUR-ACE® system is recognised as meeting the emerging requirement for international recognition.

The QUEECA project is fully described in an ebook⁶² and the principal objectives achieved were

- To create a National EE Society where it does not exist (in Kazakhstan, strengthen the existing KazSEE) and a CA Federation of EE Societies, partnered with SEFI and IFEES.
- To adapt the EAFS and formulate analogous CA Standards (CAEAS) in Russian and English.
- To create Accreditation Centres in each CA country (with a Regional coordination); train the relevant “accreditors”.
- To run a series of Trial/Actual Accreditations with international teams to test and apply the draft CAEAS and the local accreditors.
- To formulate a self-supporting financial plan for carrying out accreditation.

3.8 Programme design with reference to EUR-ACE® standards: ECD-East and PEESA projects (by G. Heitmann)

An interesting experience was the involvement of ENAEE in the development of new engineering programmes taking EUR-ACE® standards into account. The first one was the ECD-EAST project in Russia where master programmes in electrical engineering, mechanical engineering and informatics have been developed. As Russia became a signatory of the Bologna Process in engineering education the traditional system of integrated 5 year programmes towards the degree



QUEECA project meeting, 06.09.2014, Florence



QUEECA Project meeting, Huzhand, 12.10.2015

of Diploma Specialist has been replaced to a great extent by a 4 + 2 year bachelor/master system. Russia also adopted the competence and learning outcomes based structuring of programmes. Research oriented Universities had the opportunity to design curricula according to their profile and partly independent from State regulations and standards. As not much experience in this kind of systematic programme design referring to outcomes standards existed some Russian universities started to collaborate with other universities from Bologna process signatories.

One initiative was the TEMPUS Project N° 51112 “Engineering Curriculum design aligned with EQF and EUR-ACE® Standards” (ECDEAST), financially supported by the European Union. The project ran from October 2010 to October 2013. The consortium of the project consisted of the following highly acknowledged European and

62 Claudio Borri, Sergey Gerasimov, Elisa Guberti, Jose Carlos Quadrado, Onola Umankulova, Ulf Winkelmann (edited by), The QUEECA Experience: developing and Implementing a Central Asia Accreditation of Engineering Education Consistent with European Standards, ISBN 978-88-6655-958-0 (print), ISBN 978-88-6655-959-7 (online), CC BY 4.0, 2016 Firenze University Press.

Russian Universities and European Engineering Education Associations:

- Wismar University (Germany) - Lead
- Lucian Blaga University of Sibiu (Romania)
- Kaunas University of Technology (Lithuania)
- Tomsk Polytechnic University (Russia)
- Bauman Moscow State Technical University (Russia)
- Saint-Petersburg State Polytechnical University (Russia)
- European Society for Engineering Education (SEFI)
- European Network for Accreditation of Engineering Education (ENAAE)

Ian Freeston, Cyril Burkley, Giuliano Augusti and Iacint Manoliu from ENAAE and Günter Heitmann from SEFI have been involved in the activities of curriculum design, conferences and training workshops and pilot evaluations in advance of the envisaged accreditation of the new programmes

by AREE. Based on the initiative of Prof. Oleg Boev from Tomsk Polytechnic University and further developed with partners from Wismar University the main intention was the development of new engineering curricula (Master) at three Russian Universities taking into account the experience of European partner universities within the Bologna process and ENAAE/EUR-ACE® and other European Quality Assurance requirements. The main objectives of the ECD-EAST project were:

- Adapt the EUR-ACE® Framework Standards and related quality requirements, learning outcomes, and QA-accreditation procedures to the State Educational Standards of the Russian Federation for engineering curricula.
- Develop Master engineering curricula and course materials at the three Russian partner universities in accordance with Russian as well as EQF and EUR-ACE® requirements.
- Implement the new programmes in the three Russian partner universities.



ECD-EAST, 04.06.2013

The project led to the implementation of three new programmes and resulted in a book publication in English and Russian about curriculum design with reference to EUR-ACE® and other quality standards⁶³.

A similar project, again coordinated by Prof. Norbert Gruenwald from Wismar University, started in 2014 in the context of the EU Edu-Link programme under the name of PEESA: Programmes in Energy Efficiency in Southern Africa. Three South African Universities of Technology (Cape Peninsula, Tshwane and Vaal) and the Polytechnic of Namibia,

South Africa and Namibia are familiar with mandatory State and voluntary professional programme accreditation, in engineering education executed by ECSA, the Engineering Council of South Africa. The interest in applying for a EUR-ACE® label accreditation resulted from the fact that – at least at the beginning of the project – ECSA as a member of the Washington Accord accredited only the first degree level, not post-graduated master level degrees. Meanwhile and as a result of a recent revision of the South African Qualifications Framework, ECSA drafted also requirements



and Namibia University of Science and Technology, together with three German Universities of Applied Science (Wismar, Flensburg, Jena) agreed to develop and implement new Master programmes in Renewable Energy and Energy Efficiency with reference to South African and as far as possible also EUR-ACE® and other European quality standards. ENAEE was an associated partner of the project, represented by ASIIN. Main collaborator has been Guenter Heitmann, during the duration of the project also representative of ASIIN in the ENAEE Label Committee. The role of ENAEE/ASIIN was mainly the introduction of EUR-ACE® standards into the programme design process and an evaluation of developed programmes concerning their quality with regard to the ENAEE EAFSG and a potential accreditation by an ENAEE authorised Agency in the future.

for a Professional Master degree with explicit reference to EUR-ACE® standards. The EduLink project finished at the end of March 2017 with a comprehensive report about systematic curriculum design with reference to accreditation standards and with four new programmes developed, ready for implementation and first enrolment of students in 2018. An evaluation of the programmes by G. Heitmann took place in 2016. The report can function as basic information for a EUR-ACE® label accreditation. The interest of the Southern African project partner in a EUR-ACE® label accreditation persists and may become a topic of a new EU supported project, applied for by the same partners in the frame of the ERASMUS programme.

63 O.V. Boev, N. Gruenwald, and G. Heitmann (Editors), Engineering curriculum design aligned with accreditation standards, Wismar, 2013

Chapter 4

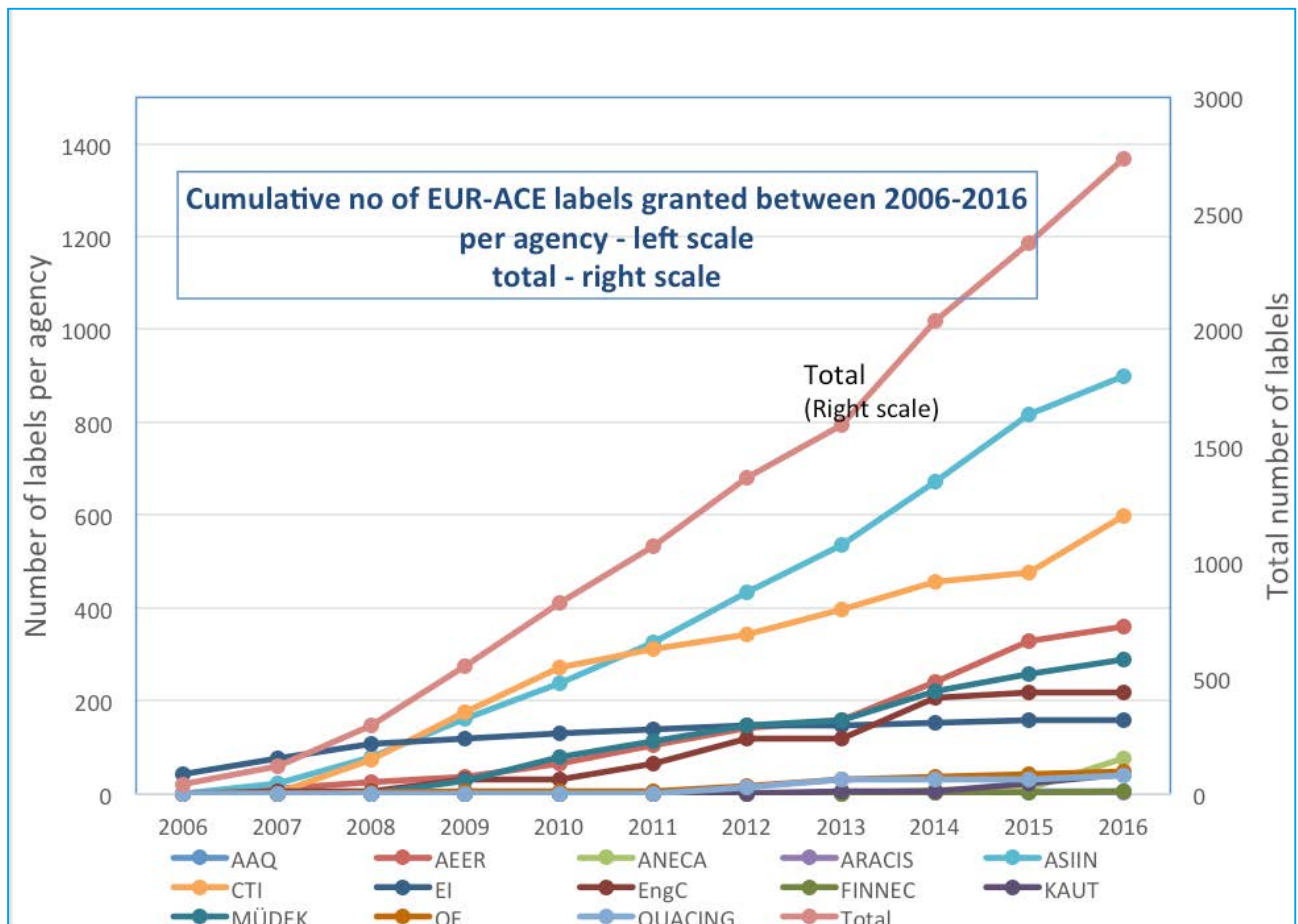
STATUS, PERSPECTIVES AND CHALLENGES OF PROGRAMME ACCREDITATION

This chapter summarises the achievements of ENAEE in the decade and provides an outlook for the future. Section 4.1 collates the factual data indicating the success of ENAEE; Section 4.2 provides a short analysis of the current status of ENAEE and an outlook for its future.

4.1 Status of the EUR-ACE® system in 2016

(by Denis McGrath)

At the end of 2016, the tenth anniversary of ENAEE, it can be said that ENAEE is in a healthy condition. The EUR-ACE® label is widely known both in the EHEA and in many other countries. Over 2600 labels have been awarded in 300 universities in 33 countries and this number continues to increase.



Our policies and procedures have been reviewed and updated. The Framework Standards which were applied to engineering degree programmes for accreditation together with standards and guidelines for accreditation agencies which had been used since our foundation were reviewed,

updated and published as the new EUR-ACE® Framework Standards and Guidelines (EAFSG) in March 2015.

The EUR-ACE® Label Authorisation Procedure was reviewed and updated to take account of what we learned from ten years of reviewing accreditation agencies which had applied for authorisation to award the EUR-ACE® label. Examples of the early and recent EUR-ACE® label certificates are given below.

international standards as described in our EAFSG. It is a valuable source of information for students, employers and the public who seek information on high quality engineering education. It is also a valuable tool for the use of engineering schools facilitating student and graduate mobility and in the



Examples of early and recent EUR-ACE label certificates

A number of agencies had accredited engineering degree programmes outside the EHEA thereby promulgating best practice in programme accreditation using the EAFSG in countries such as China, Australia, Peru, Vietnam and others. To ensure that such activities were carried out in accordance with best practice, we published Guidelines on Transnational Accreditation (including accreditation of dual degree programmes), as a two year pilot programme, in 2016.

Our website has been under continual review and many modifications have been made. Most recently significant changes have been made to the software to improve its accessibility for people seeking engineering degree programme accreditation using the Google search engine.

The two great assets that ENAEE possesses are the EUR-ACE® label and our database of EUR-ACE® labelled engineering degree programmes. All programmes listed are structured in line with the provisions of the Bologna Declaration. Our database is unique in that it is the only Europe wide list of engineering degree programmes which have been accredited in accordance with the highest

evaluation of the engineering degree qualifications of those applying for admission to post graduate studies.

Our Administrative Council (AC) and our Label Committee (LC) have continued to function effectively through the work and diligence of their voluntary members. These committees each meet four times per year while the Standing Committee of the AC meets monthly to manage the affairs of ENAEE.

As a not for profit network of volunteers, ENAEE is a good model. It continues to return a financial surplus every year providing funds for further development of the network. Above all, it functions as an independent body in accordance with the principles of enshrined in the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG), adopted by the 2005 Bergen Conference of European Ministers responsible for Higher Education.

4.2 Programme accreditation in the long term

(by Bernard Remaud)

Regarding the future of the EUR-ACE® system, it is necessary to examine the ENAEE suitability for its objectives and its sustainability, and the foreseeable evolution of engineering Higher Education to constantly improve the network structure and keep its momentum.

ENAEE SWOT analysis

In Spring 2014, the Administrative Council decided to collect the ENAEE members' view on the status of the ENAEE project (Strength/Weaknesses/Opportunity/Threats).

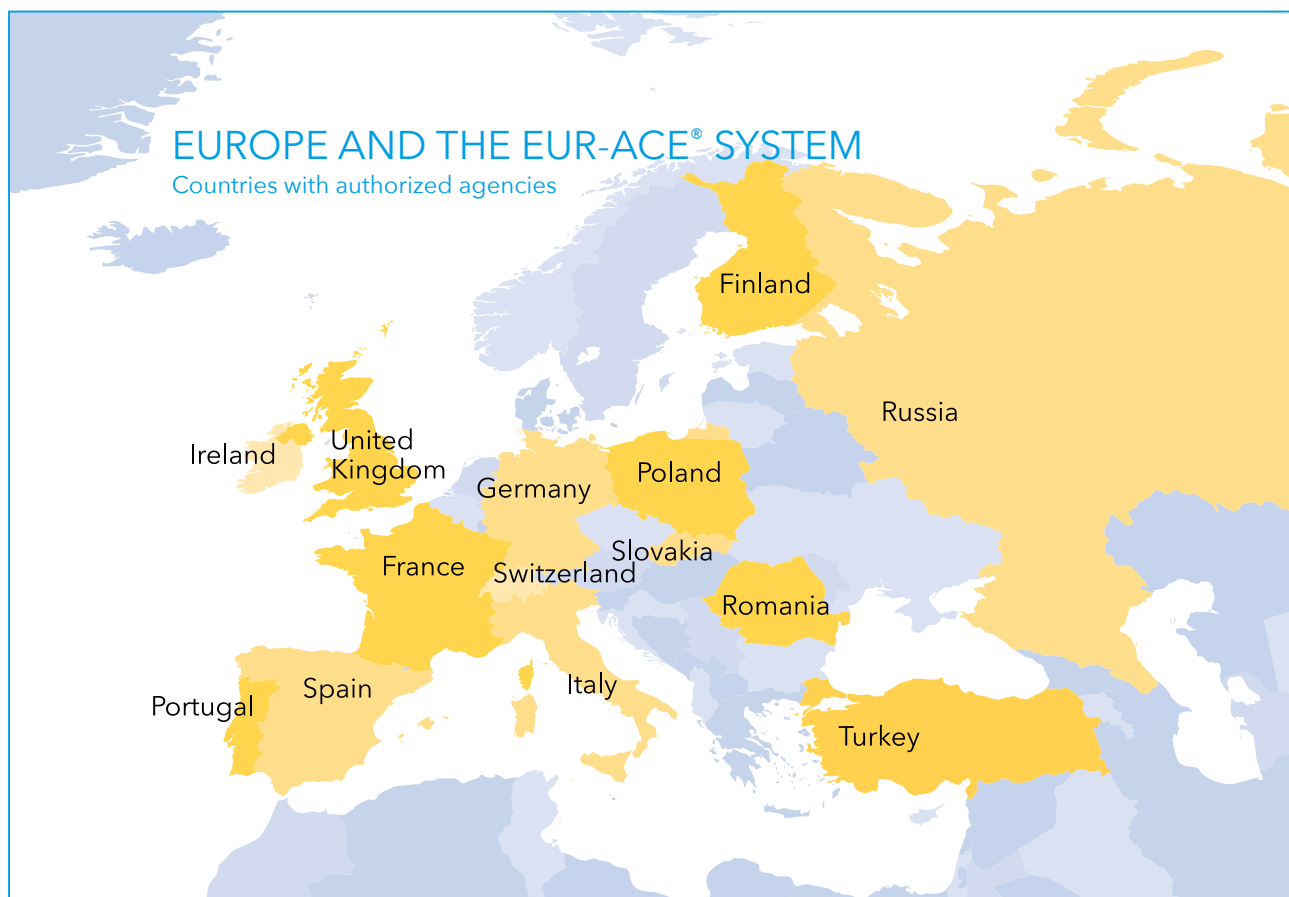
The EUR-ACE® international recognition, its support by the European Commission and its integration in the European Higher Education Area, the fitness

for purpose of the EAFSG were considered as the main strengths of ENAEE. The lack of visibility by the students and employers was considered as the main weakness; although, the responsibility of the ENAEE management was appreciated, the limited human and financial resources were also underlined.

Many opportunities were identified: new countries willing to join, collaborations with partners (FEANI, SEFI, IEA ...), widening of the EUR-ACE® system to new degrees and to new ways of learning (continuous education, long life learning).

With the growth of ENAEE, the members felt as threats: the potential loss of cohesiveness and dropping of standards, the mismatch between resources and duties.

This SWOT analysis provided the bases of an action plan having 3 axes (Spreading of the EUR-ACE®/ ENAEE system, Networking within ENAEE and with its stakeholders, Strengthening of the ENAEE organization) discussed by the General Assembly of November 2014.



Achievements and prospects

When compared with its founders' expectations, the present achievements of ENAEE can be considered as a success, in considering firstly the numbers of member agencies and of EUR-ACE® labels awarded, but also the overall recognition of the EUR-ACE® Standards and Guidelines (EAFSG) as an agreed reference framework for Quality of Engineering Education. The EAFSG have demonstrated their adaptability to the diversity of national contexts while preserving their high level of requirements. The EUR-ACE® system draws attention well beyond the European Higher Education Area as a template for countries which want to adapt their engineering education to international standards.

With more than 2600 labelled programmes and 14 agencies (2017), ENAEE is still far from covering the whole European engineering domain, there are parts of Europe (like Nordic or Balkan countries) which are little involved, whereas there are growing expressions of interest from countries from (North) Africa or Latin America.

"Engineer" is both an academic title and professional qualification; as already sketched in the first attempts to define a European Qualification framework for engineers, the EAFSG are considered as the academic core of the competences and skills expected from experienced engineers; the EUR-ACE® system is then considered as the entry route to the engineer profession.

However, the accreditation of individual programmes is a heavy process in terms of time and of human resources for the institutions (self-evaluation, report writing, audit visit), which may limit its diffusion; if the first accreditations are always considered as worth the efforts for the new insights, the recommendations and the impact of the EUR-ACE® label that they yield; on the long range, the benefits can be less significant; for example, the Flemish Parliament, to support the shift towards institutional accreditation, noted in 2015: "programme accreditation also brought about a substantial administrative and financial burden and these no longer outweighed the potential benefits". Coping with the accreditation "fatigue" will be one of the main challenges for the ENAEE agencies.

Stakeholders of professional degrees (like employers or students) cannot satisfy themselves

of quality certifications of a whole institution, as excellent as a university may be, does not mean that all its programmes are equally excellent for training of professionals, with heavy responsibilities to society such as doctors or engineers.

In a higher education landscape where institutional accreditation tends to be the norm, programme accreditation has very much its place if it demonstrates its accountability, its fitness for purpose and if the accredited faculties and their staff perceive that the benefits outweigh the burden.

Another feature that ENAEE must account for is the diversity of expectations, depending on the status (rank) of the institutions. For recent, emerging or vocational universities, the EUR-ACE® labels are strong tools for attracting students and fostering their reputation: being able to demonstrate that their degrees fulfil the highest international standards of quality is certainly appealing (the display of the EUR-ACE® logo on their website is a good indicator). The motivations of research-driven (ranked) universities are different, they expect more from their laboratory outcomes to establish their reputation and ranking; however, the EUR-ACE® system could provide them with a recognized and globally shared framework on top of which they can build their own excellence criteria. ENAEE should be eager to fulfil the expectations of all institutions: the two extremes described above and the whole range of intermediate positions.

Clearly, ENAEE should not weaken its strong commitment to quality improvement and enhancement rather than measurement and not break the glass wall between the accreditation and the ranking missions, but it must be open to evolutions of the higher education expectations.

After the 10 pioneering years, come the maturity years where ENAEE will still need to grow, but above all to take its full place among the multiple actors of the changing world of engineering education.

ANNEXES

A.1 List of present and past Administrative Council members



Present and past ENAEE Presidents:
Bernard Remaud, Iring Wasser, Giuliano Augusti

PRESENT MEMBERS AND PRESIDENT (AS OF JAN. 2017)

Prof. Dr. Bernard REMAUD
(President, from March 2014)

Mr. Ralph APPEL

Mr. Dirk BOCHAR
(Vice President, from April 2014)

Prof. Dr. Claudio BORRI

Mr. Michael BRIDGEFOOT
(Treasurer, from Jan. 2015)

Prof. Dr. Anne-Marie JOLLY

Mr. Denis McGRATH
(Vice President, from April 2014)

Prof. Dr. Sergey SHAPOSHNIKOV

Prof. Dr. Alfredo SQUARZONI

Prof. Dr. Birgul TANTEKIN-ERSOLMAZ

PREVIOUS MEMBERS

Dr. Rafael FERNANDEZ ALLER (until Dec. 2015)

Mrs. Françoise COME (until Dec. 2015)

Mr. Juhani NOKELA (Treasurer, until Dec. 2015)

PREVIOUS MEMBERS AND PRESIDENT (APRIL 2012 – MARCH 2014)

Dr. Iring WASSER (President)

Mr. Dirk BOCHAR (Vice President)

Mrs. Françoise COME (Vice President)

Mr. Juhani NOKELA (Treasurer)

Prof. Dr. Claudio BORRI

Mr. Denis McGRATH

Dr. Erbil PAYZIN

Prof. Dr. Yuri POKHOLKOV

Prof. Dr. Bernard REMAUD

Prof. Dr. Alfredo SQUARZONI

PREVIOUS MEMBERS AND PRESIDENT (APRIL 2009 – MARCH 2012)

Prof. Dr. Giuliano AUGUSTI (President)

Prof. Dr. Sebastiao FEYO DE AZEVEDO (Vice President)

Dr. Iring WASSER (Vice President)

Mr. Philippe WAUTERS (Treasurer)

Dr. Jim BIRCH

Prof. Dr. Alexander CHUCHALIN

Dr. Erbil PAYZIN

PREVIOUS MEMBERS AND PRESIDENT (2006 – MARCH 2009)

Prof. Dr. Giuliano AUGUSTI (President)

Mr. Philippe WAUTERS (Treasurer)

Prof. Dr. Alexander CHUCHALIN

Mr. Christer FORSLUND

Mr. Alan PUGH

Mr. Jean-Michel SIWAK

Dr. Iring WASSER

A.2 List of present and past EUR-ACE Label Committee members



Past and present LC Chairs and LC Secretary: Iring Wasser, Jean Claude Arditti, Rita Heissner, Timur Dogu (left to right)

PRESENT MEMBERS (AS OF MAY 2017)

Prof. Timur DOGU, MÜDEK, Turkey (Chair)
Mr. Touko APAJALAHTI, FINEEC, Finland
Prof. Giuliano AUGUSTI, QUACING, Italy
Prof. Hans-Joachim BARGSTAEDT, ASIIN, Germany
Prof. Jacques BERSIER, AAQ, Switzerland
Prof. Cyril BURKLEY, Engineers Ireland, Ireland
Prof. Guillermo CALLEJA, ANECA, Spain
Prof. David CLELAND, EngC, United Kingdom
Prof. Sergey GERASIMOV, AEER, Russia
Mrs. Elisabeth LAVIGNE, CTI, France
Prof. Bohdan MACUKOW, KAUT, Poland
Prof. Iacint MANOLIU, ARACIS, Romania
Mrs. Susana TELES, Ordem dos Engenheiros, Portugal

MEMBERS (NOV. 2012- DEC. 2016)

Dr. Jean-Claude ARDITTI, Commission des Titres d'Ingénieur, France (Chair)
Mr. Günter HEITMANN, ASIIN, Germany
Prof. Cyril BURKLEY, Engineers Ireland, Ireland
Mrs. Susana TELES, Ordem dos Engenheiros, Portugal
Prof. Ian Freeston, EngC, UK (until 31 Dec. 2013)
Prof. David CLELAND, EngC, UK (as of 1 Jan. 2014)
Prof. Sergey GERASIMOV, AEER, Russia
Prof. Timur DOGU, MÜDEK, Turkey
Prof. Giuliano AUGUSTI, QUACING, Italy
Prof. Iacint MANOLIU, ARACIS, Romania
Prof. Bohdan MACUKOW, KAUT, Poland (as of 1 March 2014)
Mr. Rafael Van GRIEKEN, ANECA (as of 1 Nov 2014)
Mr. Touko APAJALAHTI, FINEEC, Finland (as of 1 Nov 2014)
Prof. Jacques BERSIER, AAQ (as of 1 Nov 2014)

PREVIOUS MEMBERS (APRIL 2009-OCT. 2012)

Dr. Iring WASSER, ASIIN, Germany (Chair)

Dr. Jean-Claude ARDITTI, Commission des Titres d'Ingénieur, France

Mr. Denis McGRATH, Engineers Ireland, Ireland

Prof. Ian FREESTON, Engineering Council, United Kingdom

Prof. Alexander GROMOV, RAEE (now AEER, Russia)

Dr. Erbil PAYZIN, MÜDEK, Turkey

Mrs. Susana TELES, Ordem dos Engenheiros, Portugal

PREVIOUS MEMBERS (JUNE 2006-MARCH 2009)

Dr. Iring WASSER (Chair)

Prof. Oleg BOEV, RAEE (now AEER), Russia

Prof. Ian FREESTON, Engineering Council, United Kingdom

Mr. Denis McGRATH, Engineers Ireland, Ireland

Mr. René-Paul MARTIN, Commission des Titres d'Ingénieur, France

Mr. Antonio SALGADO de BARROS, Ordem dos Engenheiros, Portugal

A.3 List of ENAEE members (as of 01/2017)

FULL MEMBERS



FEANI-European Federation of National Engineering Associations (Belgium)



ENGINEERING COUNCIL (United Kingdom) (*)



CTI - Commission des Titres d'Ingénieur (France) (*)



ASIIN - Fachakkreditierungsagentur für Studiengänge der Ingenieurwissenschaften, der Informatik, der Naturwissenschaften und der Mathematik e.V. (Germany) (*)



ORDEM DOS ENGENHEIROS (Portugal) (*)



CoPI - Conferenza per l'Ingegneria (Italy)



ENGINEERS IRELAND (Ireland) (*)



AEER - Association for Engineering Education of Russia (Russian Federation) (*)



UNIFI - Scuola di Ingegneria dell'Università degli Studi di Firenze (Italy)



IDA - The Danish Society of Engineers (Denmark)



MÜDEK - Association for Evaluation and Accreditation of Engineering Programs (Turkey) (*)



IIE - Instituto de la Ingeniería de España (Spain)



ARACIS - The Romanian Agency for Quality Assurance in Higher Education (Romania) (*)



TEK - Finnish Association of Graduate Engineers (Finland)



QUACING - Agenzia per la Certificazione di Qualità e l'Accreditamento EUR-ACE dei Corsi di Studio in Ingegneria (Italy) (*)



AAQ- Swiss Agency of Accreditation and Quality Assurance (Switzerland) (*)



KAUT- Accreditation Commission of Universities of Technology (Poland) (*)



ZSVTS - Association of Slovak Scientific and Technological Societies (Slovakia) (*)



KazSEE - Kazakhstan Society for Engineering Education (Kazakhstan)



ANECA - National Agency for Quality Assessment and Accreditation of Spain (Spain) (*)



FINEEC - Finnish Education Evaluation Centre (Finland) (*)

(*) Agencies authorised to award the EUR-ACE® Label

ASSOCIATE MEMBERS



SEFI - Société Européenne pour la Formation d'Ingénieurs (Belgium)



CIAEP - Center for Independent Accreditation of Engineering Programs (Ukraine)



FIGURE NETWORK- A Network of French Universities for Engineering (France)



IGIP - International Society for Engineering Pedagogy (Austria)

ACKNOWLEDGEMENTS

The activities that lead to the development of the EUR-ACE® system and the ENAEE as reported in this e-book involved collaborative efforts of many individuals and organisations. The editors would like to acknowledge the key players involved in these activities and would also like to apologise those who we may have been missed.

The European Commission was instrumental in funding the key projects which lead to the birth and further development of the EUR-ACE® system and ENAEE. These projects were realised by the joint efforts of many individuals coming from a wide range of organisations. Efforts of those who played key roles in these projects are acknowledged (the Editorial Team apologizes for names omitted because of lack of memory):

- TREE Thematic Network: Claudio Borri (UNIFI) was the Legal Representative, Francesco Maffioli (Politecnico di Milano) was the project coordinator and Elisa Guberti (UNIFI) was the Project Manager. Management Committee included Giuliano Augusti (Univ. di Roma La Sapienza), A. Avdelas (Aristotle Univ. of Thessaloniki), K. Hawwash (Univ. of Birmingham) and M. Markkula (Helsinki Univ. of Technology).
- ESOEPE: Permanent Secretariat was Philip Wauters (FEANI) and the Permanent Steering Committee included Giuliano Augusti (SINAI), Ferreira Lemos (O.D.E.), Denis McGrath (EI), Alan Pugh (ECUK), Ernest Shannon (ECUK), François Taily (CTI) and Iring Wassser (ASIIN).
- The initial EUR-ACE Project: Giuliano Augusti was the project coordinator and Philippe Wauters of FEANI was the Project Legal Representative. The project board was chaired by Alan Pugh (ESOEPE) and included René-François Bernard (ENQHEEI), Jim Birch (ECUK), Oleg Boev (RAEE), Claudio Borri (UNIFI), Pierre Compte (EUROCADRES), Sebastião Feyo de Azevedo (Ode-PT), Jan Graafmans (CESAER), Torbjörn Hedberg (SEFI), Michael Hillery (IEI), Iacint Manoliu (UAICR), Alfredo Squarzoni (CoPI), François Taily (CTI), Iring Wasser (ASIIN) and, Philippe Wauters (FEANI). The project steering committee was chaired by Giuliano Augusti and included Antonio Salgado De Barros, Alexander I. Chuchalin, Ian Freeston, Günter Heitmann, Kruno Hernaut, Michael Hillery, João Duarte Silva, Jean-Michel Siwak, Alfredo Squarzoni and, Iring Wasser.
- EUR-ACE Implementation Project: Claudio Borri (UNIFI) was the project legal representative, Giuliano Augusti (ENAEE) was the project coordinator; the project manager was Elisa Guberti (UNIFI). The project board included Guy Aelterman (NVAO), Sebastião Feyo de Azevedo (OE-PT), Jim Birch (ECUK), Oleg Boev (RAEE), Demetres Briassoulis (AUA), Pierre Compte (EUROCADRES), Vibeke Fahlèn (IDA), Iacint Manoliu (UAICR), Denis McGrath (Engineers Ireland), Ayse Erdem-Senatarlar (MÜDEK), Jean-Michel Siwak (CTI), Alfredo Squarzoni (CoPI), Emanuela Stefani (CRUI), Jorg Steinbach (SEFI), Iring Wasser (ASIIN), Philippe Wauters (FEANI), Lesley Wilson (EUA) and Gaston Wolf (BBT).
- PRO-EAST Project: Claudio Borri (UNIFI) was the project legal representative, Oleg Boev (RAEE) was the grant coordinator and the project manager was Elisa Guberti (UNIFI). The project board included Giuliano Augusti (CoPI), Françoise Come (SEFI), Alexander Chuchalin (Tomsk Polytechnic University) and Philippe Wauters (FEANI).
- EUR-ACE Spread Project: Claudio Borri (UNIFI) was the project legal representative, Coordinator Giuliano Augusti (ENAEE) was the project coordinator and the project manager was Elisa Guberti (UNIFI). The project board included Françoise Come (SEFI), Iacint Manoliu (ARACIS), Mats Pahlman then Pierre Compte (EUROCADRES), Erbil Payzin (MÜDEK), Nora Skaburskiene (SKVC), Alfredo Squarzoni (CoPI), Iring Wasser (ASIIN) and, Philippe Wauters (FEANI).
- QUEECA Project: The QUEECA project was conceived and its core idea was initiated by Prof. Valerij Antonov (EKSTU, KZ), whose memory is gratefully honoured here. The project coordinator was

Claudio Borri (UNIFI, IT) and the project manager was Elisa Guberti (UNIFI, IT). The project board included Bakhytkul Abdizhapparova (SKSU, KZ), Saidulla Abdil Abylov (KSUCTA, KG), Alpha Akhrova (TTU, TJ), Giuliano Augusti (QUACING), Marat Checheibaev (KSTU, KG), Françoise Come (SEFI), Rudiger Hoffer (RUB, DE), Mehmet Karamanoglu (MDX, UK), Abulniyozov Kurbanbay (MHSSE, UZ), Talat Magrupov (TSTU, UZ), Gulmira Mamyrganova (SILAEIMESKR, KG), Larisa Marchenko (MESKR, KG), Omirbaev Serik Maulenovich (MESKR, KZ), Galym Mutanov (KaZNU, KZ), Luca Podestà (UNIROMA, IT), Yuri Pokholkov (ENAE), José Carlos Quadrado (ISEL, PT), Saule Rakhmetullina (EKSTU, KZ), Abdujabbor Azizovich Rakhmonov (Min. Ed., TJ), Zafar Razykov (MMIT, TJ), Yusupov Sabirjan (TUIT, UZ), Galina Smirnova (KSTU, KZ), Alfredo Squarzone (USGIT, IT), Lyazzat Tastanova (ASU, KZ), Partner 18 Onolkan Umankulova (EdNet, KG), Iring Wasser (ASIIN) and Bazarkul Zholdybekova (KazSEE, KZ).

- ECD-East Project: Project Legal Representative and the Project Board Chairman was Norbert Grünwald. Project Board included Regina Krause (HSW), Oleg Boev (TPU), Anastasia Kriushova (TPU), Lyudmila Rezhikova (BMSTU), Alexander Surygin (SPbSPU), Constantin Operan (LBUS), Daiva Dumciuvienė (KTU), Günter Heitmann (SEFI), Giuliano Augusti (ENAE), Evgeniya Kulyukina (TPU), Vyacheslav Potekhin (SPbSPU) and Mikhail Ivanov (BMSTU). The programmes were evaluated by a team that included Ian Freeston and Cyril Burkley as ENAE representatives.

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