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Designing National Engineering Certification System Based on International Standards

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This paper describes the issues involved in the development of the Russian National Engineering Certification System within the framework of the National Competency and Qualification System (NCQS). Example of foreign experience in engineering qualification licensing is highlighted, including NCEES (USA). Integration of Russian National engineering certification system into different international structures, such as FEANI Register, APEC Engineer Register, and EMF has been highlighted. The development version of the systematic interaction between engineering education accreditation and engineering certification centers, involving partners (institutions, enterprises and professionals) has been proposed, as well as the interaction with monitoring committees.

Key words: *qualified engineer, licensing, accreditation, certification, registration, international recognition.*

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Promoting the professional competence of Russian engineers is the major national long-term challenge, which, in its turn, furthers the dynamic technological development of the country.

In developed countries (USA, Great Britain, Japan, etc.) this problem-solving involves existing systems of licensing and/ or certification and registration. In most cases, these systems are the second step in the quality certification of engineers. The first step includes the public-professional accreditation of academic curricula in technology and engineering, confirming the quality of basic engineering education in a university. As a rule, both stages are implemented by non-profit professional organizations, using corresponding criteria and procedures.

Administrative-legislative status of accreditation and certification organizations, as well as other important regulatory issues in engineering education and engineering are based on the advanced regulatory legal framework. Licensed engineers (professionals) are a select group.

An example is the National Council of Examiners for Engineering and Surveying (NCEES) in the USA. NCEES is responsible for the administration of the exams that engineers must pass in order to become certified as a Professional Engineer. It develops, administers and scores the examinations used for engineering licensure in different states of the United States.

Candidates who have met specific qualification requirements receive an engineering licensure as a professional engineer. Engineering licensure

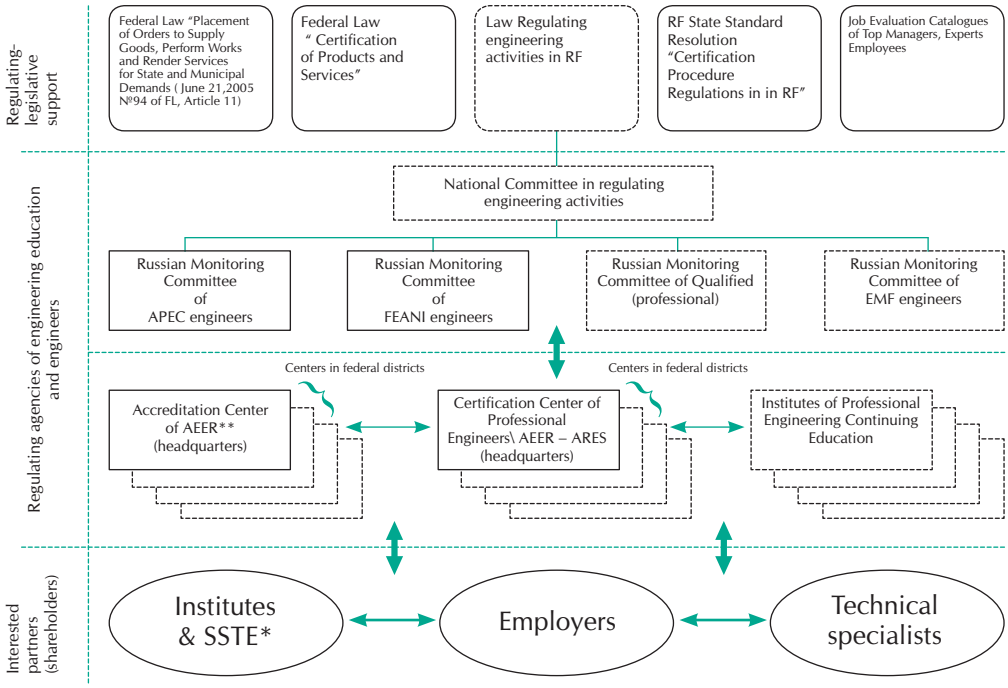
is for those engineers involved in the public service sector. Not all engineers become licensed, especially those working in private companies. However, most engineers do achieve licensure to enjoy the professional benefits that accompany this distinction- career options as career promotion or high salary.

There are more than 470 thousand licensed engineers in the USA, who embrace one-third of the total number of professionals. In Russia there are approximately 5 million technical experts (i. e. engineers of different professions). About 10% of this total (500 thousand engineers) are highly-qualified professionals working in the top-priority and high-tech industrial sectors and, at the same time, significantly influence the technological development of the country. Based on the experience of different countries, including the USA, 20-30% of these professionals (i.e. about 100-150 Russian engineers) could be licensed and become licensed engineers, i.e. "the select group" of the country.

One scenario in developing a National Engineering Certification & Registration System of "elite" engineers in Russia is to establish a National Committee in regulating the engineering activities.

It is assumed that the National Committee in regulating the engineering activities would coordinate the work of the Russian Monitoring Committee of Professional Engineers, administering the certification of engineers according to national (state) criteria, as well as Russian Monitoring Committees of international organizations FEANI, APEC Engineer Register and EMF providing the engineer with

Fig. 1 Overview Diagram of National Engineering Education Accreditation System and Certification of Engineering Qualifications.



** SSTE - Special Secondary Training Establishment*
*** AEER – Association for Engineering Education of Russia*
**** ARES – Association of Research and Engineering Societies*

licensure in accordance with international standards [1,2].

Conversely, the national monitoring committees will administer the performance of accreditation and certification centers, as well as Institutes of Professional Engineering Continuing Education, located in different federal districts.

Services of the National System of Certification and Registration of Professional Engineers are for all interested partners, such as technical institutions (SSTE), employers (enterprises, companies, etc.) and the engineers (i.e. different technical specialists)

In designing the National System of Certification and Registration of Professional Engineers it is viable to observe the following steps:

- develop and implement the regulatory and legal framework administering the role of those public-professional organizations responsible for developing relevant professional engineering requirements, criteria and certification and registration procedures, as well as requirements for further professional engineering training;
- develop and implement such incentives that would further not only the introduction, but also the integration of certified professional engineers (certified according to national and international standards) into non-public (private) companies and businesses;
- develop and implement both incentives and forcing regulations to further not only the introduction, but also the integration of certified professional engineers (certified according to national and international standards) into public corporations and public-private partnership companies.

The procedure implementation of designing the National System of Certification and Registration of Professional Engineers involves respective amendments and additions within the existing regulatory and legal framework (Federal Law "Certification of Products and Services", Federal Law " Further Training Education", Federal Law "Placement of Orders to Supply Goods, Perform Works and Render Services for State and Municipal Demands (June 21 2005 №94 of FL, Article 11), RF State Standard Resolution "Certification Procedure Regulations in RF", Job Evaluation Catalogues of Top Managers, Experts and Employees).

The first step in designing the National System of Certification and Registration of Professional Engineers is to complete the draft of Federal Law "Regulating Engineering Activities in RF", which, in its turn, should highlight such issues as the development of engineering education and engineering in the context of today's Russia.

At present the National System of Competency and Qualifications (NSCQ) is being developed and is coordinated by the Autonomous non-profit organization "Agency of Strategic Initiatives in Project Promotion" (ASI).

In this case, the National System of Certification and Registration of Professional Engineers should be an integrated part of the National System of Competency and Qualifications (NSCQ). The first step could be the establishment of a federal network of Accreditation Centers of Engineering Education and Engineering Certification (Table 1). The target group involved in the successful implementation, design and execution of such Accreditation Centers of Engineering Education and Engineering Certification are mainly three adopter categories:

1. Educational designers of academic programs in technology and engineering and university faculty.

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Table 1

№	Activities	Expected result (outcome)	Involved participants
1.	Analysis of latest global experience in designing the regulating systems of engineering education and engineering, as well as Russian experience in this area	1.1. organizing a study team (ST) including authorized representatives of interested parties; 1.2.fundamental principles in designing the regulating system of engineering activities	- interested RF ministries and executive departments: RF Ministry of Education and Science; RF Ministry of Economic Development and Trade (MEDT); - representatives of public professional associations: Association for Engineering Education of Russia (AEER), Association of Research and Engineering Societies (ARES), Chamber of Commerce and Industry (CCT), and others
2.1	Motivation and incentives of interested parties (institutions, employers, engineering specialists) to further active involvement in the public-professional accreditation and certification professional procedures by amending the existing legislative regulations	2.1.1 set of documents including respective amendments and additions within the existing regulatory and legal frameworks 2.1.2. discussion of proposed amendments in relevant ministries and executive departments 2.1.3 submitting proposed amendments to Federal Assembly of the Russian Federation, their adoption and enforcement	- study team (ST) - Agency of Strategic Initiatives in Project Promotion (ASI) - relevant ministries
2.2	Project draft of the Federal Law "Regulating Engineering Activities"	project of Federal Law "Regulating Engineering Activities"	Study team (ST)
3.	Establishment of headquarters within existing Certification (ARES) and Accreditation (RSEE) Centers, including approved standard organizational support Establishment of Certification and Accreditation Centers in every federal district	existing Accreditation Centers of Engineering Education and Certification of Professional Engineers (headquarters- one in every federal districts)	Study team (ST) President Administration representatives of RF Regional administrations Regional CCT
4.	Follow-up improvement and enforcement of Federal Law "Regulating Engineering Activities" in view of the real-life experience in designing and executing the National System of regulating engineering activities	Federal Law "Regulating Engineering Activities"	ASI Study team (ST)

Curriculum planning is based on the requirements for academic programs and professional competencies, which, in its turn, furthers the program-on-demand and future international accreditation of these programs;

2. University graduates in technology and engineering, those involved in professional activities and interested in national and international certification and registration to enhance their competitiveness not only in the domestic labour market but also in the global one;

3. Employers in the high-tech economic sector interested in promoting domestic and global competitiveness owing to the national and/or international certified engineers within the company itself. This group acquires a competitive position in national and international tenders, as well as the possibility of signing government and international contracts.

The existing in-process materials and experience of the project promoters further the successful implementation of developing the National System of Certification and Registration of Professional Engineers. Association for Engineering Education of Russia (AEER), a member of the European Network of Accreditation in Engineering Education (ENAEE) and Washington Agreement (Washington Accord), has developed and been successfully implementing the program accreditation criteria and procedures in accordance with international standards. More than 200 Bachelor and Master degree programs, as well as professional graduate programs of leading Russian and Kazakhstan institutions have been accredited, being awarded EUR-ACE Label. Graduates of such accredited institutions (i.e. accredited programs) can be entitled European Engineer (EurEng), registered in FEANI Register and, in the future, receive the "European Professional Engineering Card" through the Russian Monitoring Committee FEANI. In 2010 AEER has become an authorized organization in Russia to administer international certification of engineers in accordance to APEC Engineer Register standards.

Based on the international standards of APEC Engineer Manual and IEA Graduate Attributes and Professional Competencies AEER has developed and successfully implemented regulating-organizational procedural framework of the professional certification systems [3]. In accordance with the international standards of APEC Engineer Register, more than 60 professional engineers in high-tech enterprises have been certified in the Certification Center of Engineering Education and Engineering, National Research Tomsk Polytechnic University.

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REFERENCES

1. International Engineering Alliance [Electronic resource]: [offic. site]. – [Wellington,2012]. – URL: http://www.ieagreements.org, free. – Tit. from the screen.
2. European Federation of National Engineering Associations [Electronic resource]: [offic. site]. – Bruxelles, 2012. – URL: http://www.feani.org/site, free. – Tit. from the screen.
3. Chubik, P.S. (2010) System of Certification and Registration of Professional Engineers in Russia based on APEC Engineer Register /P.S. Chubik, A.I. Chuchalin, A.V. Zamyatin// Journal Engineering Education № 6, pp. 58–63.