AN INTERDISCIPLINARY MASTER'S DEGREE PROGRAM IN THE FIELD OF POWER INDUSTRY: CHALLENGES AND OPPORTUNITIES

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Abstract

Introduction and aim: Energy is the mainstay of the economy. It has a measurable impact on the country's development, plays a leading role in creating and developing the material and technological base, increasing efficiency in the production and in improving the standards of living.
A significant role is given to the training of highly qualifieed specialists for this sector in compliance with modern requirements and industry needs.
A Master's degree program "Power Industry Technology and management" was developed at the Department of Energy and Telecommunications of Akaki Tsereteli State University, which is being successfully implemented for eight years.
The proposed research is aimed at studying the specifics of implementation and replication opportunities of an interdisciplinary Master's degree program in the field of power industry.

Research methodology: Analysis of existing experiencers in implementation of the interdisciplinary Master's degree programs.

Results and implications: A Master's degree program "Power Industry Technology and Management" is characterized by stability, and it allows for training specialists with appropriate general and field competences, who are equipped with appropriate technical knowledge and managerial and regulatory skills suitable to industry.

Conclusion: Implementation of an interdisciplinary Master's degree program fosters the training of highly qualified specialists for the field of power industry and allows the specialists of other related sectors for acquiring the necessary knowledge and skills to do their jobs well in power industry plants.

Keywords: interdisciplinary Master's degree program, Power Industry, technology and management.

1 DESCRIPTION OF MASTER'S DEGREE PROGRAM "POWER INDUSTRY TECHNOLOGY AND MANAGEMENT"

1.1 Master's degree program structure

The development and implementation of an interdisciplinary educational programs is one of the pressing issues in the field of power industry technology and management that allows for training of highly qualified personnel for the energy sector in Georgia.

The Akaki Tsereteli State University is one of the higher education institutions in West Georgia, which trains specialists of electric power field of industry.

A Master's degree program "Power Industry Technology and Management" was developed in 2010 at the Faculty of Technical Engineering of the Akaki Tsereteli State University, with the support of the United State Agency for International Development within the Energy Capacity Initiative project (USAID ECI). The existence of this program was due to several significant factors, among which the following ones should be highlighted: a significant step-up of activities in the country's energy sector, especially in the field of power industry that requires the recruitment of highly qualified personnel.

The mentioned program is focused on that group of problems, which is related to the training of highly positioned engineering and managerial staff for the country's energy sector. This particularly relevant for the training of managerial staff, since it is the staffing area, where personnel deficiency takes place.

Studies have shown that shortages of specialists equipped with specific technical, managerial, economic, legal and environmental knowledge and skills, still remain relevant for the country's electricity-generating facilities.

The mentioned Master's degree program completely meets the short-, medium- and long-rem requirements of the energy sector of Georgia. The program "Power Industry Technology and Management" is presented in the form of an interdisciplinary program of energy technology and management. All the training courses are included in this program purposefully for studying and overcoming the particular needs.

The program structure accurately reflects the current needs of the energy sector of Georgia and aims to equip specialists with knowledge and skills, which help them to address the existing problems.

The mentioned Master's degree program consists of several training blocks. The leading role has been assigned to subjects related to power industry technology and management. These courses are: electric power generation, transmission and distribution.

The program comprises the training courses related to the energy sector economics and management. It includes the following subjects: "Management of Energy Enterprises", "Power Industry Policy", "Energy Regulatory Frameworks", "Power Markets and their Management", "Project Design and Management".

As is known, the energy sector significantly affects the environment and the climate. So, the mentioned Master's degree program gives a special place to those training courses, which relate to this area. In particular, the program comprises the following courses: renewable energy sources, energy efficiency and energy-saving technologies, energy audit, energy and environmental protection.

The program provides basic knowledge of both power industry technology and management. It assists in the development of managerial skills that is today so necessary for the country's electricity-generating facilities, electric power generation, transmission and distribution companies hydro and thermal power plants, etc.

The proposed complete Master's degree program comprises a total of 120 ECTS credits and covers 2 academic years.

1.2 Learning outcomes of Master's degree program

A significant of master's degree program is focused on achievement of learning outcomes, which eventually define the competences of the program's graduates. The program's learning outcomes are consistent with the framework of higher education qualifications and particular industry standards. Of particular interest are the industry-specific competences (Table 1), which have been developed along with general competences in cooperation with the interested parties as follows: employers, teaching staff, students and graduates. As is known, in accordance with the description of higher education qualifications in Georgia, the learning outcomes comprise six criteria: knowledge and understanding; skills of practical application of knowledge; conclusion making skills; communication skills; learning skills; values.

Table 1. Learning outcomes of Master's degree program "Power Industry Technology and Management" (Industry-specific competences).

Knowledge and understanding	Possessing specific knowledge of power industry technological process (electric power generation, transmission and distribution) and ability to make managerial decisions on the basis of this knowledge. Understanding the role and place of power industry in the country's economy. Understanding the essence of power industry management and its social importance. Possessing knowledge for using mathematical methods and models in management.
Skills of practical application of knowledge	Ability to formulate and resolve the managerial problems specific to the field of power industry with the optimal use of resources. Knowledge of data and results processing methods (including computer-based methods), ability to use them according to their intended purpose, and ability to make conclusions. Ability to design research and to process and generalize the results obtained. Ability to use mathematical methods in managerial activities. Ability to systematically analyze general trends and particular situations existing in the area of power industry. Ability to develop and implement the projects in the area of power industry.

Conclusion making skills	Ability to analyze the industry-related information, qualitative and quantitative data, and to make conclusions for forecasting and planning. Knowledge of the principles of power market administration and ability to use them under real circumstances.
Communication skills	Possessing managerial skills, and ability to provide organization and coordination of work of staff members. Ability to plan and control activities associated with project management. Ability to monitor and control implementation of other projects, and to make conclusions and give recommendations. Ability to analyze information on the work done, to make conclusions and prepare reports, and to communicate in writing and orally in Georgian and foreign languages. Ability to make the exciting presentations by using office programs and equipment.
Learning skills	Ability to evaluate critically their own professional knowledge and skills and possessing skill of optimum planning of training process throughout life. Ability to evaluate the needs for professional knowledge of staff members and to give them recommendations for improving this knowledge, or to provide expert device to them. Ability to carry out independently research activities. Possessing sufficient knowledge to continue their study at the doctoral level.
Values	Ability to analyze the important social problems and processes. Having the standing culture of thinking, and knowledge of norms of oral and written communication. Ability to improve their own professional level by using modern imnformation technology. Contributing to the introduction of the creative initiatives, rationalization proposals and novel technologies. Taking an active public position, striving for popularization of energy efficiency and energy conservation, promoting the use of renewable energy sources.

It should be noted that then industry-specific competences represent one opf the most important factors graduates competitiveness and their access in the employment market.

1.3. **Master program's target groups**

The program is aimed at training of specialists possessing the general and industry-specific competences corresponding to the second step of higher education, who are equipped the engineering-technical knowledge and managerial skills, and are oriented to a competitive labor market of the sector of power industry.

Proceeding from an interdisciplinary nature of the program, the target groups involve graduates from Bachelor or Master programs related to different engineering and economic areas. The program is a good opportunity for students to acquire a new qualification.

It should be noted that during the operation process of this program, over 100 young specialists used this opportunity and received qualification of Master of Science in Energy and Electrical Engineering.

It is necessary to underline the fact that qualification of Master of Science in Energy and Electrical Engineering allows their holders for being employed in a competitive market of the energy sector.

As is known, the energy sector is less attractive to women. However, in favor of the mentioned Master program, it should be noted that it achieved a certain degree of popularity among women, and 20% of graduates from this program are women that must be judged positively.

2 FURTHER DEVELOPMENT OF MASTER'S DEGREE PROGRAM "POWER INDUSTRY TECHNOLOGY AND MANAGEMENT"

2.1 Master program SWOT analysis

The SWOT analysis carried out with the participation of various interested parties, points as to strengths and weaknesses, so to the opportunities and threats of the mentioned Master program.
Among the strengths, the following factors should be highlighted:

- The program has been developed on the basis of the requirements of the interested parties, such as: employers, teaching staff, graduates and students.
- The program has been developed taking into consideration of successful experience of implementing similar programs by the leading universities and with a view to local circumstances.
- The program has been successfully implemented for 7 years at the Akaki Tsereteli State University and is popular with beneficiaries that is also conditioned by the leading role of industry itself and high labor market demand for its graduates.
- The program has a perfect structure and meets the power industry requirements.
- The opportunity for graduates to continue their study at the following step (doctoral level) directly at the university.
- The program is delivered by highly qualified and greatly experienced teaching staff.
- The program is provided with laboratory base, which allows for performing laboratory works satisfying a number of the modern requirements.
- The program is provided with the cooperation capacities with representatives of the appropriate areas that is proved by the signed Memorandum and long-term agreements.
- The program envisages the requirements of developing and defending independently the Master papers.

Among the weaknesses of master program, the following factors should be highlighted:

- A lack of available teaching materials issued in Georgian language.
- Students' low level of knowledge of foreign language that hinders the wide use of teaching materials issued in foreign languages.
- Teaching staff does not have a wide choice of the opportinities to improve their professional skills both on a spot basis and outside the coutry.

A significant resource for further development and improvement of Master program is represented by the following opportunities:

- Participation in the international programs, projects and networks. For example, it should be highlighted that the Department of Energy and Telecommunications of the Akaki Tsereteli State University, with its Master programs, is involved in the UNI-SET European network of universities.
- Cooperation with other leading energy companies for the purpose of improving the training capacity, providing students internships and developing their practical skills, and further development of teaching staff.
- Involvement of students in the exchange programs.
- Collaboration with other Georgian universities in the research and educational fields.
- Traineeships for teaching staff in universities abroad.
- Invitation of professors from universities abroad to deliver lectures, organizing training for teaching staff.
- Involvement of students in the granted programs (for example, Georgian Energy Development Fund).
- The existence of high professional potential of employers and their willingness to cooperate.
- The existence of the employment market in Kutaisi and West Georgia.

In addition, there are some threats, which may hinder the further development of the mentioned Master programs. In particular, the following factors should be highlighted:

- The employment market saturation and relaxation of the requirements at the appropriate specialties of the program.
- The economic crisis of the country, which may prevent the development of power industry field.

2.2 Master program sustainability and development prospects

Sustainability of the mentioned Master program is conditioned by various factors, among which the emphasis should be placed on the fact that to date, the energy sector in Georgia is one of the most advanced and employable industries, there exists high demand for highly qualified specialists and, most importantly, this sector is distinguished by high wages in the country's realities. Currently, demand for highly qualified specialists in energy and electrical engineering is growing increasingly in our country.

Furthermore, it is necessary to note a high rate of the employement of graduates from the mentioned Master program, especially in the sector of energy. More than 80% of graduates work at the power industry companies holding leadership positions.

The msantioned Master program is continuously updated and developed in response to the existing requirements. Thus, the modified version of program was prepared for 2012 accreditation process, as a result of which the share of technical subjects was increased dramatically, teaching of mathematical modeling was improved, the emphasis was placed on the issues of energy efficiency and renewable energy sources, and s[ecial attention was given to the energy regulation and policy-making issues.

The multi-year operation of Master's degree program "Power Industry Technology and Management" demonstrates that as an interdisciplinary program, it is being implemented quite successfully and contributes to the training of highly qualified specialists for such a leading sector as power industry.

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