

DEVELOPMENT OF NUCLEAR EDUCATION AND SPECIALISTS TRAINING IN THE REPUBLIC OF KAZAKHSTAN

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Abstract. Issues of nuclear education and personnel training in Kazakhstan are highlighted. Problems of university nuclear engineers training are reviewed. Role of the National Nuclear Center of Republic of Kazakhstan in preservation and maintenance of nuclear knowledge in country is emphasized. Possibilities for integration of nuclear education, science and technology on the base of Kazakhstani nuclear research facilities are considered.

1. Introduction

In the National Programme of the Republic of Kazakhstan “Education” the problems in the field and education and specialists training are stated. In particular it is points to, that “... in the professional high education system a gap in interaction between universities and science academic sector, as well as industry and experimental bases is growing. That leads to future specialists training quality deterioration in both curricular process and in-plant training”.

In the university personnel training education a washing of “outlay-intensive” specialties is occurring, in particular by natural-sciences and technology trends. A majority of universities’ graduates are finishing their training after the first degree of a multilevel education.

In this domain the issues of student in-plant training, organization of laboratory and practical courses, implementation of training research work on the base of plants with up-to-date technologies are requiring critical decision.

Now there is necessity in development a new national concept for after-university education. The integration of science and education most effectively would be realized in the field of after-university professional education. This problem demands decision of issues related with effectiveness of organization, investments and management.

The activities in nuclear education and personnel training sphere for the Kazakhstani nuclear-industrial complex have the same problems, but during the last decade a several steps for these problems solution were undertaken.

2. Preservation and maintenance of nuclear knowledge. Nuclear education

After the USSR collapse, in Kazakhstan the problem of existing nuclear scientific and industrial potential preservation had been raised. Within severe economical depression period the Government of Kazakhstan accepted decision about establishment of National Nuclear Center of the Republic of Kazakhstan (NNC RK). The NNC RK was created in 1992 on the base of the former Semipalatinsk test site and relating research institutions and objects [1].

One of the principal tasks of NNC RK is formation of research and technical, technological and personnel base for nuclear energy development in the country. Intrinsically, the decision about NNC RK establishment have been permitted stopping a leakage of research and engineering staff, and involving it to experience transferring to young specialists generation. So, NNC RC creature facilitated not only preservation of unique scientific and technological base, but it assisted to nuclear knowledge maintenance and preservation in the young sovereign state.

At present NNC RK incorporates 4 research institutes (Institute of Atomic Energy, Institute of Nuclear Physics (INP), Institute of Radiation Safety and Ecology, Institute of Geophysical Researches) and 2 industrial plants (Baikal Enterprise, Kazakh State Research-Industrial Center for Explosive Operations).

The base facilities of the Center are 4 research reactors (WWR-K, EWG-1M, IGR, RA) and accelerating facilities (isochronous cyclotron, small-sized cyclotron, electrostatic discharge accelerator UKP-2-1, electron accelerator ELV-4). All these facilities are widely using in nuclear science development as a whole and high-qualified researchers training in particular [2-5].

Before the USSR disintegration nuclear physicists and engineers for Kazakhstan were generally qualifying in the leading institutes of the Russian Federation. Today in accordance with Governmental Degree "On atomic energy development in the Republic of Kazakhstan" no. 1344 from 18.10.95 a number of agreements with leading universities of Kazakhstan and foreign countries on nuclear profile personnel training were contracted.

With purpose of training national personnel for nuclear power engineering for the first time in Kazakhstan the student training by new curriculum "Nuclear Reactors and Power Facilities" was opened in Shakarim Semipalatinsk State University (SSU) [6-7].

The curriculum was developed by scientists of the SSU and NNC RK in close cooperation with specialists of Russian universities – Tomsk Polytechnic University (TPU) and Moscow Physical-Technical University. The collaboration with these authoritative - in the field of nuclear education - universities conduces to development of the curriculum meeting to internationally accepted higher university degrees on nuclear technology. For the SSU's academics the traineeships in TPU with terms from 1 month to 1 year have been organized.

The training term of the curriculum is 5 years and 6 months. Here in accordance with training process technology the students training by two-year fundamental course, and beginning third-year-course the in-plant training is conducting in the base of NNC RK facilities, with involving high-qualified personnel of the Center's research institutes.

Annually on the base of NNC RK more than 200 students of SSU by specialties both "Physics" and "Nuclear Reactors and Power Facilities" are excising by laboratory practicum by disciplines: Atomic Physics, Nuclear Physics, Solid State Physics, Particles Interaction with Matter, Neutron Physics. Practicum is conducting on the facilities arrangement in the special equipped training auditoria, or immediately on operating facilities and laboratories of NNC RK. A major part of expenses for the students training by these specialties the NNC RK assume on itself.

Besides, new specialty "Thermal Physics" related with profile of NNC RK was planned for opening at SSU, as well as the proposal before the Government of Kazakhstan about implementation the specialized faculty for professional training of students for nuclear industry by the K. Satpaev Kazakh National Technical University was initiated. The two subdivision of the INP NNC RK were created in the two intensively developing areas of the Republic – West- and East-Kazakhstan regions. As well as the two laboratories of this institute were opened in the places where nuclear weapon tests were conducted – former Semipalatinsk test site and Azgir test site – that will be used for personnel training [8].

3. Perspectives of integration of nuclear science, education and technologies

The analysis of world experience in integration of high education with science, and advanced technologies showing that most effective path for such task decision is creation a large research and technological complexes in multi-profile universities.

Example of integration of science and university education in Kazakhstan will be implantation of the Inter-disciplinary Research Complex at the L.N. Gumilev Eurasian National University (ENU) [9].

The core facility of the complex is the DC-60 cyclotron of heavy ions, now the facility is under construction; term of it putting into operation is 2006. Design of the facility is developed by researchers of the International Inter-Governmental Organization – Joint

Institute for Nuclear Researchers - and INP NNC RK. These works are carrying out on the base Astana Filiation of INP NNC RK.

The DC-60 cyclotron will be unit for working out fundamental and applied researches, development of new technologies in the field of physics, chemistry, biology, and medicine; as well as it allow to provide training students, researches, academics, and postgraduates.

Putting into operation of DC-60 cyclotron would gave possibility for carrying out investigations in such new nuclear physics trend as nuclear membranes production, which could be a basis for a number of nanotechnologies and science-intensive business.

On the base of Inter-disciplinary Research Complex on Heavy Ions at ENU a new standards of education and science within ‘university – technopark’ organization structure are planning for testing. It is suggested that this organization structure will be combine a training process, research and innovation activities.

Sizable Governmental financial support for ENU and effective actions of its specialists allow believing that the ‘university – technopark’ organization structure will be start-up in the nearest future.

Now the ENU is a large intellectual, scientific and educational center of Kazakhstan. The University incorporates 6 profile institutes carrying out training of students by 99 specialties. Among it research affiliations, except of the “Inter-disciplinary Research Complex on Heavy Ions”, there are Institute of Fundamental Researches, Astana Filiation of INP NNC RK, Filiation of M. Lomonosov Moscow State University, Filiation of Institute of Space Researches “Center of Space Monitoring” and etc.

Other initiative interesting for development nuclear knowledge activity is creation of Kazakhstan Material-testing Tokamak (KTM). KTM presents the experimental thermonuclear facility for materials examination in energy loads modes close to ITER [10].

Collaborative works of the NNC RK and Russian Scientific Center “Kurchatov Institute” on KTM scientific development and construction are conducting from 1998. KTM putting into operation is planning in 2006. At present on the base of KTM in Kurchatov city the steps by organization of International Laboratory in the Field of Thermonuclear Researches are undertaken. Tasks of this laboratory include scientific provision of works for KTM creation, working out of experimental studies on controlled thermonuclear synthesis, and conducting of specialists training on the international level. The laboratory will be a part of the Technopark of Nuclear Technologies of NNC RK.

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