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The analysis of activity on removal from operation of the Chernobyl atomic power station, experience of the first year after closing power station.

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Abstract

Removal from operation of power units of nuclear stations in the various countries last decade the usual phenomenon. Good practice on a successful conclusion from operation of power units in Japan, USA is turned out, Germany, Russia and other countries. The features inherent in the Chernobyl atomic power station make this process especial, unique.

Introduction

On the Chernobyl atomic power station was maintained 4 power units with reactors RBMK-1000 (Reactor Big Capacity With Channels) till April, 26, 1986.

Commissioning of the power unit #1 was carried out in September, 1977, the power unit #2 - in January, 1979, the power unit #3 have entered in December, 1981, and the power unit #4 - in December, 1983.

The fourth power unit was destroyed during failure in April, 1986.

The second block was stopped after a fire in a machine hall in October, 1991.

In 1995 The government of Ukraine was accepted the decision on closing Chernobyl nuclear station till 2000.

The power unit #1 was stopped in November, 1996.

The power unit #2 was stopped in December, 2000.

At present the structure of Chernobyl station includes three nuclear power units:

The first power unit is in stages of the discontinuance of operation, a reactor shut down, all fuel is unloaded from an active zone and is in spent fuel pit, complex engineering inspection of the power unit is executed;

The second power unit is in stages of the discontinuance of operation, a reactor shut down, all fuel is unloaded from an active zone and is in spent fuel pit, complex engineering inspection realizing on the power unit ;

The third power unit is in stages of the discontinuance of operation, a reactor shut down, it is in subciticality, the significant part of fuel is unloaded from an active zone and is in spent fuel pit, works going on the program of the discontinuance of operation;

The Shelter Object - a complex of constructions in which the destroyed designs of the fourth power unit including fuel-bearing weights of a former reactor, and serves for the control and management situation after Chernobyl accident.

The structure of the Chernobyl atomic power station includes also various buildings and constructions of an infrastructure of station: the reserve boiler-house, a systems of water supply, the water drain, an auxiliary services, a hydro constructions together with a pond - cooler which after Chernobyl accident of 1986 is considered time storehouse of radioactive waste products.

The Chernobyl atomic power station has developed about 308 740 million kw-hour electric power in During all power life (about 23 years). The 158 530,8 million kw-hour - after failure.

The power station final shut down has not solved all problems, and has added new. The political decisions are not always agreed with the technical and financial opportunities.

Let's stop on concrete features of the Chernobyl atomic power station which do its unique in a number of other objects which are shut down. For simplicity of a review it is possible to designate them as political, economic, technical, scientific, ecological, social. All of them are close from each other

Political features.

The question of closing of the atomic power station has risen on a wave of populist applications of new politicians of the first parliament of independent Ukraine and was turned out in the decision of a legislature of the state from 1991 about closing the Chernobyl atomic power station in 1993. The first years of becoming of the state have greatly changed political and economic conditions and have forced a management of the country, politicians to reconsider the estimations and more strictly to approach to accepted decisions and opportunities of their performance. Closing of power station was postponed on later term.

On the one hand pressure of the international nuclear lobby which wishes that a society on has always forgotten a word Chernobyl and the associations connected to it about danger of nuclear reactors, and, thus is faster to restore trust of the public to atomic engineering. And also to not admit competitor on the European market of the with cheaper electric power.

On the other hand the responsibility before the future generations for ecological well-being of a planet, inadmissibility of easing of a key economic branch of the industry and a national economy.

The Chernobyl atomic power station was finally stopped in December, 15, 2000, in result of all these processes.

Any significant consecutive technical and organizational work on preparation of NPP to closing in this period was not carried out, and therefore for practical realization of process of removal from operation Chernobyl NPP was not prepared. It is a example of bad practice.

Economic features.

The economy of Ukraine could not rebuild to stable condition from the date of the formation and to this day. The electric power industry is in heavy position also. Problems of maintenance with fuel, financings of a repairs, a works on scientific and technical support

sharply stand before each power enterprise. A fixed capital quickly grow old, modernization of manufacture is not made almost. It concerns also to nuclear stations of Ukraine. The atomic engineering survives today due to reserves which were saved up earlier.Therefore financial assets which need to be provided in the budget on closing of the Chernobyl atomic power station, from the maintained atomic power stations to take there is no opportunity.

According to the Complex Decommissioning Plan of the Chernobyl NPP, that was accepted by the government of Ukraine in 2000, the total cost of works not less 793 924 million Euro. Expenses for prime objects (the heat provide of shutdown units and objects for treatment radioactive waste) constitute 288, 2 million Euro.

The difficult economic condition of the country demands special efforts in financing this process.

Ukraine searches for supports at the world community, is especial initiators of preschedule closing of the Chernobyl NPP, however a question this complex(difficult) and long, and works on closing are necessary for carrying out now. Ukraine apply for supports at the world community, who was especial at those initiators of preschedule shutdown Chernobyl NPP, however this problem is difficult and long, but works implementation on decommissioning are necessary for carrying out now.

It is an example of bad practice.

Technical features.

Reactors of the Chernobyl atomic power station have differences from those reactors on which already there is an experience of decommissioning.

Reactor RBMK is very big and complex installation which contains a lot amount of the radioactive equipment. For example the sizes of shaft of a reactor make up 21,6 x 21,6 x 25,5 m, quantity of technological channels in which fuel cartridges are located, - up to 1693, channels of a control system and protection - up to 277, in a reactor is about 1850 ton graphite. Dismantle of such installation in radioactivity dangerous conditions and its transformation into a safe condition is very complex engineering task. It is necessary to note, that a plenty of firm and liquid radioactive waste products should be advanced, they were saved up during operation and now stored in territory of power station. Also it is necessary to solve some questions connected with the technology of radioactive waste and a final burial place of highly active radioactive waste. Additional technical difficulties are caused by presence radioactive pollution of all objects of station and a pond - cooler after Chernobyl accident. It demands special design decisions on their decommissioning and additional processing of radioactive waste.

The problems connected to transformation of object “Shelter” in ecologically safe system.

The Chernobyl atomic power station is not ready yet to work on decommissioning in the technical plan: the intermediate storehouse of the fulfilled nuclear fuel just is under construction, in Ukraine there is no infrastructure for the management with highly active radioactive waste and their final burial place in deep geological formations.

The full work cycle by the management with liquid and firm radioactive waste is not ready while at station, these facilitys only are under construction. The design documentation on works on decommissioning is not ready.

Technical complexity of process decommissioning is increased by those conditions which occur from requirements of observance in developed projects of features of separate objects, and requirements of Chernobyl zone of alienation as a whole. As well, design works should be conducted in parallel with research, research-design, and also operation on three power units simultaneously.

Scientific features of closing of the Chernobyl atomic power station.

Nonordinary works on the Chernobyl atomic power station and absence of experience of decommissioning installations with reactors RBMK demand powerful scientific and technical and engineering support.

After there was disintegration of the USSR, all scientific-research organizations, which were earlier, occupied in questions of designing, constructions of Chernobyl NPP, appeared located in the Russian Federation and they work in her interests now. Ukraine for the present has not created necessary scientific base of support of atomic engineering, the glory of existing and perspective scientific research institutes and laboratories still more ahead. Therefore attraction to scientific support of works on decommissioning of the scientific and engineering organizations as in Ukraine, and abroad, first of all Russian - as designers and developer of the Chernobyl NPP project, has the big value for safe work.

Environmental features.

Constructed in the north of the Kiev area the Chernobyl NPP in due time has considerably changed natural environment of the Ukrainian Polesye.

Intrusion of the person has resulted in formation of new elements of a landscape, for example a pond-cooler, to changes of components of biosphere of region from which depend regional ecosystem. Process of liquidation of an industrial object provides restoration natural ecosystem in a original kind. Significant radioactive pollution of territory of the Chernobyl zone of alienation has made practically impossible full restoration and revival of all ecosystem in original and the more so an original kind in the nearest future accessible to a review. However it does not mean, what will not be actions for restoration of the natural environment. Numerous researches carried out in the period after Chernobyl accident has shown, those local biological systems, despite of radioactive pollution, continue to develop actively. And that circumstance, what the person has left these territories, has resulted in increase of number of many kinds of animals and has created more favorable conditions for their residing. Thus the purpose of activity in this direction should be understood as assistance to natural processes of updating and development of a nature, in view of the radiating factor. Unconditional observance of all nature protection principles by the Chernobyl NPP decommissioning does not cause doubts. Additional ecological requirements to process decommissioning are put forward with actual transformation of these territories into radio ecological reserve.

Social consequences of closing of the Chernobyl NPP.

The 9051 workers were worked on the Chernobyl NPP at the moment of closing. In city of Slavutich living 26 thousand inhabitants, middle age of them is 30 years. The most part of the city budget is provided with power station.
All infrastructure of city was provided due to the profit of power station, namely: transport, a municipal services, education, medicine.

The government of Ukraine and management Chernobyl NPP develop the Plan of social protection of the personnel of power station at it decommissioning. The problem of social consequences today manages to be solved successfully due to this plan. The total number of personnel Chernobyl NPP for this year was reduced up to 5122 persons; number of the industrial personnel has changed with 5661 up to 4733 persons, and the nonindustrial personnel with 3390 up to 389 persons. All dismissed have received social protection of various kinds. Creation of new workplaces, the efforts effective using human resources, service of social payments to the rejected personnel, preservation of an infrastructure of city has protected inhabitants Slavutich from social impact and there may be an example a positive practice of the decision of such complex question in conditions of the limited economic opportunities.

Object "Shelter".

The object "Shelter" is an integral part of all complex of problems of the Chernobyl NPP. This unique construction not having analogues in the world. The status of object is determined by regulating body of Ukraine so: The object "Shelter" represents destroyed by beyond design-basis accident the fourth unit of the Chernobyl atomic power station which has lost all functional properties of the power unit and where was realized prime actions for reduction of consequences of accident are executed and performing works on maintenance its nuclear and radiating safety systems.

The international project, which is financed from the special fund created by world commonwealth the so-called Plan of realization of actions on object "Shelter" - Shelter Implementation Plan (SIP), is based on the stage-by-stage approach to transformation of object and its area to ecologically safe system. Today it is possible to speak, that the first phase of the project - gathering of the information and development of concepts successfully approaches to end and begins following - design engineering and construction.

It is necessary to note, that problems of object "Shelter" cannot be solved it is isolated from problems of the Chernobyl NPP and needs for the whole energy branch of Ukraine.

Conclusions.

The government of Ukraine, despite of difficulties of today's economy, allocates significant financial assets on performance of works on decommissining of the Chernobyl atomic power

With the purpose of maintenance of all kinds of activity which are connected to decommissioning of power units NPP's of Ukraine and transformation of object "Shelter" in ecologically safe system, on the basis of the Chernobyl atomic power station was created The State Specialized Enterprise "Chernobyl NPP" which is appointed the operator of nuclear installations on area of Chernobyl NPP. SSE "Chernobyl NPP" is maintaining organization of

nuclear installations on a stage of their decommissioning, and also operating radioactive waste facility and storehouses for their temporary storage according to laws of Ukraine.

In world practice still there is no experience of decommissioning reactors RBMK. After Ukraine this problem will be to solve other countries - Lithuania (the Ignalina NPP) and Russia (the Leningrad, Kursk, Smolensk NPP's), therefore Chernobyl experience will be useful to them. Probably and other countries will become interested in this experience.

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