

ПРЕЗЕНТАЦІЯ/ЗАХИСТ ПРОЕКТУ «OUTLOOK FOR NUCLEAR POWER AFTER FUKUSHIMA'S TRAGEDY»

УДК 378.937 + 378.126 + 378.144 + 370.153

Панченко М.О., Голубенко Л.М., Каравасва Т.Л.

Мета пропонованого дослідження полягає в наступному: описати презентацію проекту «Outlook for Nuclear Power after Fukushima's Tragedy»; показати міжпредметний та дослідницький характер проекту; серед дослідницьких проектів виділити такий тип, проекту як дослідницький проект, актуальність якого зумовлена подіями сьогодення; показати спрямовуючу роль вчителя, в результаті якої більшість учасників проекту стають прибічниками однієї гіпотези за темою проекту.

Ключові слова: презентація, підготовчий етап, стадія планування, стадія прийняття рішень.

ПРЕЗЕНТАЦІЯ/ЗАЩИТА ПРОЕКТА «OUTLOOK FOR NUCLEAR POWER AFTER FUKUSHIMA'S TRAGEDY»

Цели настоящего исследования состоят в следующем: описать презентацию проекта «Outlook for Nuclear Power after Fukushima's Tragedy»; показать межпредметный и исследовательский характер проекта. Среди исследованных проектов выделить такой тип проекта, актуальность которого обусловлена событиями сегодняшнего дня. Показать направляющую роль учителя в результате которой участники проекта в большинстве своем становятся сторонниками одной и той же гипотезы по теме проекта.

Ключевые слова: презентация, подготовительный этап, этап планирования, этап принятия решений.

PRESENTATION OF THE PROJECT «OUTLOOK FOR NUCLEAR POWER AFTER FUKUSHIMA'S TRAGEDY»

The goals of the article are as follows: to show the realization of intradisciplinary character of the projects «Outlook for Nuclear Power after Fukushima's Tragedy». To describe a special type of the project which consists of students investigation of a highly typical problem which is brought to life by the world events of the present day. To show the guiding functions of the teacher during the discussion at the presentation of the project.

Key words: presentation of the project, preparatory stage, planning stage, taking decision stage.

Згідно зі сценарієм презентація/захист проекту проводиться в одній із шкіл міста.

Вона проводиться у вигляді дискусії, на ній присутні учні двох паралельних груп одного класу. Учні беруть участь у проекті в наступних ролях: провідні професори й академіки Академії Наук в області атомної фізики та геофізики, прем'єр-міністр, представники комісії за контролем використання атом-

ної енергії, представники міжнародного комітету з ядерної і радіаційної безпеки, керівники і головні фахівці науково-дослідних установ, представники міської адміністрації, закордонні гості, представники Greenpeace International, інспектори з атомної і радіаційної безпеки та інші гості.

На стінах аудиторії висять виготовлені учнями наочні приладдя з теми проекту.

Дискусію починає ведучий, роль якого виконує вчитель.

Master of Ceremonies (M.C-s): Respected guests, we've gathered to discuss a problem which is a burning problem of the present day for the whole world.

Everybody knows that on the 11-th of March terrible news spread all over the world an earthquake followed by a tsunami was registered in Japan. The magnitude of the quake reached 9.8 which is nearly the highest. The most terrible consequence of the quake was a destruction of the atomic power plant in Fukushima, the result of which is leakage of radiation. A great lot of people have perished. The zone of 50 kilometers around Fukushima is announced the Disaster Zone. The people are being evacuated. Admittance is prohibited into the zone of 20 kilometers around Fukushima.

Though we aren't able to solve the problem and find out answers to all problematic questions, I think the time passed since the tragedy in Fukushima has been enough for the people, experts, leading scientists and politicians to comment on the situation.

So, our discussion is about **the outlook for atomic energy after Fukushima's tragedy. Speak your mind.**

The floor is given to an expert in atomic physics Academician P.

Academician P.: Ladies and Gentlemen, the first thing we must do concerning; the disaster of the atomic power plant in Fukushima is to present our condolences to the relatives of the victims who have perished. We must express our gratitude to those experts, engineers, workers and common people who at the risk of their lives are now working at the destroyed power plant doing their best to improve the situation.

As to the outlook for atomic energy I should say that atomic energy will go on developing. Surely in the course of its development there would be elaborated some new measures of boosting atomic power plants' maintenance.

M. C-s: I see there are some people who are eager to speak out.

A Guest: My name is Andrey, I'm a university student, and I was deeply shocked to hear that the peaceful atom is considered to go on developing. And this after the tragedies in Hiroshima, Chernobyl and Fukushima! The peaceful atom is to be prohibited and mankind must abandon nuclear power if we want to save our planet and its population [2: 8].

A Guest: I am Victor Petrov, an engineer by profession. I support Andrey's opinion. Nuclear power plants are to be rejected. The atom for peace is at the same time the atom, for, death. It's high time for a moratorium of the peaceful atom.

M.C-s: I see, your point of view and that by Andrey drastically differ from those shared by the respected scientist. I'd like professor N. from the Academy of Sciences to comment on the ideas uttered.

Prof. N: Both Victor and Andrey have reasons. But as an expert I should say that the Fukushima power plant was built 40 years ago. Since then new principles

and ways of constructing and operating power plants have been introduced. Today nuclear power units are built according to a totally different design. Among other things, they are equipped with passive safeguards and it means that earthquake-proof and tsunami-proof are provided. So, the events in Japan will have no impact whatsoever on nuclear projects scheduled through 2030.

M.C-s: Are there any other opinion as to launching nuclear projects in future? I see that representatives of Greenpeace International would like to be given the floor. You are welcome.

A Representative of Greenpeace International: Greenpeace International doesn't support that point of view. Some nuclear experts admit that, on the contrary, events in Japan might change the situation in the global energy industry and worsen the outlook for nuclear plant construction contracts. We consider the optimism of nuclear industry leaders as an attempt to mitigate potential criticism and panic over nuclear power.

A Representative of Greenpeace International: My colleague is right. Nowadays the concepts «atom for peace» and «the atom for death» are synonyms. Even if Man would stop constructing new power plants, it doesn't completely solve the problem. The question is how to safely maintain the power plants which are already in operation. Man is not able to stop processes of nuclear fusion or nuclear fission which now are going on uncontrolled in Fukushima. That's why people have no trust in it [2: 5].

Our, Green deputies in India inform us about the situation there. The people that live around Indian nuclear Plants don't want them. Villagers and rural folks are exposed and die like rats and ants. It's time for Moratorium and not for new nuclear projects [1: 9].

M.C-s: Who'll comment on the view of representatives of Greenpeace International? The floor is given to a representative of the International Committee of Atomic and Radiation Safety.

Committee of Atomic and Radiation Safety: First of all I'd like to say that using emotions while discussing such a burning problem as nuclear energy outlook is wrong. It will only help us to deviate from the topic of our discussion. By the way, I should say that the data of our inspectors in India do not contain such awful information which you've just mentioned.

Environment Ministries all over the world report that world economy needs time to develop renewable energy sources. But in the coming years it can't meet the world energy needs without nuclear power. Doesn't it mean that rejecting nuclear power plants right now is impossible? Mankind needs future-oriented policies as to the peaceful atom and not your partisan bickering.

A Representative of Greenpeace International: We don't have anything to do with partisan bickering. We only want to ask the peoples of the world whether they are fully aware of the great Risks that disasters like that in Fukushima poses both for them and the World Scientific Elite. Proliferation of atomic energy must be stopped!

A Guest: In my opinion atomic energy is not an automobile engine which can be switched off with one turn of the key. Atomic energy is not a kind of energy to be stopped like this. It would be very easy to settle all the problems of atomic energy by banning its application..

I suppose it might slacken its pace in order to elaborate more effective ways of maintaining atomic power plants and more secure ways of radioactive safety. After it is achieved atomic energy will go on developing and achieve its full swing again.

M.C-S: I thank everybody for speaking out. I'd like to sum up our discussion. I'll take liberty of saying that there have been uttered three hypotheses of developing nuclear energy in future. According to one of them atomic power plants are to be rejected and banned. Proponents of the other hypothesis insist on further, developing nuclear energy projects. And the third hypothesis presents the idea of elaborating new and more effective ways of maintaining atomic power plants and more secure ways of radioactive safety after which atomic energy will go on developing and achieve its full swing again.

Right now I suggest the following: let's take a vote to see how many people support each of the hypotheses. And after the vote is over you may go on speaking in support of your opinion. Are there any other propositions? If there are no, then let's, start taking the vote.

Після голосування один з учасників дискусії за доручення ведучого повідомляє результати голосування:

Hypothesis 1, i.e. banning and rejecting atomic power plants - 10 voters.

Hypothesis 2, i.e. further developing nuclear energy projects - 9 voters.

Hypothesis 3, i.e. elaborating new and more effective ways of maintaining atomic power plants and further continuation of the use of atomic energy - 8 voters.

Abstained from voting - 3 voters

M.C-s: So, we've got the results of the vote. Now I suggest that everybody speak out in support of the hypothesis he/she voted for.

Учитель по черзі надає слово всім бажаним висловитися.

Hypothesis 3 supporter: I support hypothesis 3 which, in my opinion, is the most reasonable. I'd like to ask others why they are against it.

Guest: We don't support it because it seems groundless to us. Scientists are unlikely to invent anything what can guarantee safety of the reactor when a powerful earthquake occurs. If it were possible, they would have already done it.

Hypothesis 3 supporter: It's strange to here it. We agree that it is impossible to stop the processes of nuclear fusion or nuclear fission. And nothing can be undertaken to stop them. But to minimize the effect of various natural cataclysms on life reactor seems possible. The destructive force of earthquakes, the height of tsunami waves, the volume of water they bring, the force of tornadoes are factors which are calculable. It means that a system of protection of the reactor can be designed.

M.C-s: Are there any other opinions?

Hypothesis 2 supporter : I'd like to say that to criticize application of atomic energy is not difficult. But is there another cheap and clean source of power and electricity? Fossil fuels are not clean, they lead to carbon emissions. And their amount in nature are limited.

A Greenpeace International Representative supporter of Hypothesis 1 :

It is very well known that there do exist alternative energy sources: solar energy, wind power, and biomass. Here at the poster all of them are shown.

These sources of power are renewable and clean and do not hide any danger in their application.

M.C-s: Thank you. I see your colleague is eager to speak out.

A Greenpeace International Representative supporter of Hypothesis 1:

Greenpeace advocates reduction of fossil fuels by 50% by 2050 and phasing out nuclear energy. By 2050 majority of electricity will be generated from renewable sources.

Hypothesis 2 supporter: We have some other data: Wikipedia writes that by 2013 in the USA coal and gas electricity industry will be worth 85 billion dollars, while nuclear power generators are forecast to be worth 18 billion dollars. In Europe atomic energy is not going to be phased out as well.

Hypothesis 2 supporter: I'd like to comment on the use of renewable sources of energy. It would be perfect if fossil fuels and atomic energy were replaced by them. But we should be realistic. In practice it is impossible. The three of them can't be compared in their efficiency either to atomic energy or to fossil fuels. Their application is very limited.

Foreign Guest-Hypothesis 2 supporter: I fully agree with you. Solar energy as a source of heating can be used only in the South. Wind power can be used for producing electricity only for a private house. The speed of cars with solar batteries as well as the distance they are able to cover is also limited. Application of biomass as a source of energy results in producing petrol which is a fossil fuel.

Guest-Hypothesis 2 supporter: Power plants produce energy to heat water to produce steam which is then used to produce electricity. The atom heats Chukotka and many other geographical areas. Many military and some civilian ships, for example, icebreakers, use nuclear marine propulsion. Nuclear reactors launch space vehicles. Its advantage is evident.

Guest-Hypothesis 1 supporter: Efficiency of atomic power is really indisputable. However, all these applications of the peaceful atom turn our planet into a plutonium-fueled economy. A lot of problems arise and no answers to them haven't yet been found. One of them is nuclear garbage. The future generations won't thank us for this. Proliferation of atomic energy must be stopped!

M.C-s: Our discussion is rather heated. Let's ask our scientists to comment on it.

Academician Alexandrov (Institute of Atomic Physics): You are quite right: the two views on the problem we've heard are completely different, the opinions have polarized. There is nothing surprising in it. After Hiroshima and Chernobyl people are aware and frightened of the hazards of radioactive contamination. Some people are eager to proclaim banning of the use of nuclear energy. They think it'll solve the problem. But, as it has already been mentioned to-day, banning the nuclear power plants won't help to improve the situation. The power plants constructed at the beginning of the Nuclear Age are still operating and they can't be stopped, they can't be removed from service. And today's generation of scientists must perform their special duty. They must take up on themselves the responsibility for finding out new scientific, technical and technological potentialities which would make operating nuclear reactors safe and secure in spite of all possible disasters of nature.

Prime Minister of the Country: I fully support the idea by acad. Alexandrov. The branch of industry which is called atomic energy needs some revision, some additional investigation into the problems of its safety. The world needs a new kind of atomic energy which wouldn't pose many threats to people and environment. The investigation is to be carried out at the expense of the governments of leading countries of the world and generous donations from businessmen.

Mayor of the City: The tragedy in Fukushima has put new tasks which, as acad. Alexandrov mentioned, ought to be faced and solved by the present day generation of scientists as a duty of the people living in the Nuclear Age. And, I suppose, this is an international problem. Efforts of all the countries ought to be united.

Academician Vetrov (Institute of Geophysics of the Earth): The disaster in Fukushima added one more factor to the list the safety factors of application of atomic energy: power plants are highly vulnerable to extremely violent earthquakes and tsunami.

M. C-s: Could such a disaster have been foreseen in Japan? Could it have been avoided?

Academician Vetrov (Institute of Geophysics of the Earth): Unfortunately, the answer is a dispiriting one: yes, concerning the geophysical peculiarities of Japan, such disasters could have been and must have been foreseen. This was a money saving factor which made Japan's nuclear regulators and the owners of the power, plant not to have taken into consideration a possibility of such extremely violent earthquake and tsunami. They didn't think it could occur during the **lifetime** of the power plant in Fukushima. Its life time is 40 years and it has nearly came off. The death toll and a heavy toll on the environment are now evident as a result of it. That's why the Prime Minister was quite right: the world needs a new kind of atomic energy which wouldn't pose many threats to people and environment.

Deputy of Parliament: Do you think there are real scientific and technological possibilities to avoid such disasters in future?

Academician Vetrov (Institute of Geophysics of the Earth). I really think there are such possibilities for the power plants being constructed nowadays and in future.

A Foreign Guest: Your answer sounds rather optimistically. However, I'd like, to-ask you what your opinion is about the future of the power plants which are as old as the Fukushima's one.

M. C-s: I think there are too many questions to Academician Vetrov. And we'll ask another academician from the Institute of Geophysics of the Earth to answer this question. Ivan Petrovitch, wouldn't you be so kind as to give some information on the problem?

Academician Grinchenko (Institute of Geophysics of the Earth): I don't have any special data. My personal opinion is as follows: the maintenance of power plants constructed 30, 40 or more years ago is a very complicated problem. However, I think that a tendency of getting positive results in this field really exists. If scientists and experts in different branches of science and technology combine their efforts and if their joint projects are encouraged with financial

incentives,; I'm sure, a set of correct and successful decisions of the problem might be found.

A Foreign Guest: And can't you tell us whether there are any measures to be taken to-day to prevent disasters at power plants which have been operating for a longtime?

Academician Grinchenko (Institute of Geophysics of the Earth): Certainly, there are a lot and now their list is being worked out.

M. C-s: I suppose we can get a detailed answer from the Radiation Safety Inspectors who have been invited to take part in our discussion.

Radiation Safety Inspector: Nowadays seismic safety of all power plants in the world - and our country is included - is being checked up. To say more exactly, practical possibilities of seismic safety of each power plant is being revalued. This work is being carried out by the experts of the Institute of Geophysics of the Academy of Sciences.

Prof. Senkov (Institute of Geophysics of the Earth): Moreover, the International Atomic Energy Agency - which is called *MAFATE* in Ukrainian - is working out a methodology of conducting stress-tests for all power plants in the world. This work is to be over in a fortnight, and all European power plants will be tested.

A Second Guest: Can't you say some more words about these stress-tests? Don't they conceal any danger for power plants?

Prof. Senkov (Institute of Geophysics of the Earth): No, they don't. People shouldn't be afraid of the stress-tests. They don't include any imitation of natural cataclysms, like a flood or an earthquake. The stress-tests consist in a kind of extending computer calculation of what additional loads can arise at a power plant in case of the earthquakes, floods, hurricanes, tornadoes and such like natural events.

A Third Guest: Haven't calculations of this kind been carried out when the power plants were constructed?

Prof. Senkov (Institute of Geophysics of the Earth): Unfortunately they were not carried out and that's why such data were not used in their design. It should be said, some modern methods used nowadays were not available at the time when most of the power plants were constructed.

A Fourth Guest: Suppose, these calculations are carried out. What's then?

Prof. Senkov (Institute of Geophysics of the Earth): I suppose the inspector could give a more detailed answer to the question.

Radiation Safety Inspector: After the stress-test is calculated for each of the power plant in the world, then a list of additional safety measures is given is to each of the power plants.

A Fifth Guest: Can't you say more exactly what these additional safety measures, are?

Radiation Safety Inspector: Depending upon the results of the stress-test for each of the power plant, among additional safety measures there might be: installing some additional diesel engines at a power plant, to provide a power plant with additional, water storage reservoirs, to provide a substantial quantity of sulphuric acid and others.

M. C-s: I'm glad we are having an interesting and lively discussion. Let me take part in it too. Has the world's outlook of the atomic energy changed after

the Fukushima Tragedy? Are there any volunteers to speak out their minds as to this problem?

Prime Minister: It can be definitely stated that the world's outlook of the atomic energy has changed for the better. The public, businessmen and scientific community are now aware of the necessity of constant investing money in maintenance and improvement of power plants. 550 million Euros were collected the other day to improve the situation in Chernobyl. New stress-tests for power plants of the world are being elaborated. They are to find out which of them wouldn't fail in case a tsunami waves are of 14 meters high and the most powerful earthquake take place. Provision measure are elaborated as to the power plants with a low level of safety.

M. C-s: Respected guests, our discussion is coming to an end. It seems to me it has, been rather friendly and meaningful. Right now I suggest to take another vote to see how many people support each of the hypotheses.

Після голосування один з учасників дискусії за доручення ведучого повідомляє результати голосування:

Hypothesis 1, i.e. banning and rejecting atomic power plants - 3 voters.

Hypothesis 2, i.e. further developing nuclear energy projects - 9 voters.

Hypothesis 3, i.e. elaborating new and more effective ways of maintaining atomic power plants and further continuation of the use of atomic energy -15 voters.

Abstained from voting - 3 voters

M. C-s: Now, let's compare the results of the first vote with the results of the second one.. **Hypothesis 1**, i.e. banning and rejecting

atomic power plants _____ 10 voters / 3 voters

Hypothesis 2, i.e. further developing nuclear energy projects _____ 9 voters / 9 voters

Hypothesis 3, i.e. elaborating new and more effective ways of maintaining atomic power plants and further continuation of

the use of atomic energy _____ 8 voters / 15 voters

Abstained from voting _____ 3 voters / 3 voters

M. C-s: As one can judge from the results obtained in the two votes now we can say our discussion was not only friendly, it was interesting, meaningful, useful and fruitful. It helped some participants to form their civil position and opinion of one of the burning questions of the present day.

Література

1. Anti-nuclear movement – <http://en.wikipedia.org/wiki/Anti-nuclear-movement>.

2. John W.Gofman. M.D. Ph.D – Reacting to Reactor, The “peaceful atom»: Time for a Moratorium – <http://www.ratical.org./radiation/CNS/Moratorium.html>.