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BIOLOGICAL EVALUATION OF NUCLEAR POWER PLANT BY EMPHASIZING BOUSHEHR NUCLEAR POWER PLANT

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ABSTRACT

One of the most important issues that is now discussed on nuclear power plant of Bushehr, is the safety of the plants, and when building, what regulations should be applied when producing and implementing the electricity, first to avoid the pollution of the environment, and second to prevent the technical defects such as to crack, puncture and bursting the components carrying the water-current and steam contaminated with radioactive substances that cause the irreparable losses and damages to the health and life of the people neighboring the plant. It is difficult to examine the issue that to what extent the regulations are applied when building and launching the nuclear plants.

In this research, Total effective dose equivalent (TEDE) and Collective dose (CD) will be calculated for most of the undesirable potential events in nuclear power plant of Bushehr from the perspective of releasing radioactive substances in the environment. The calculations run using Gaussian distribution model and a modified version of computer code AIREM to take the situation in Bushehr. The results of the final analysis were used to report DOZAM code. The results show no additional doses in densely populated areas. Maximum TEDE is

determined in WSW direction. CD in the area around the nuclear power plant within 30 km (man Sv 138) are accepted much lower than limits. Thyroid dose equivalent is calculated to WSW direction (Maximum mSv 25.6), and the reactor is estimated at several chimneys. The investigation concluded that the Bushehr nuclear power plant, such as other nuclear power plants in the modern world, has the highest nuclear safety standards.

Keyword: Bushehr, Nuclear Power Plant, Persian Gulf, Safety

STATEMENT OF THE PROBLEM

The impact of activities on the environment surrounding nuclear power plants and the potential release of radioactive materials is one of the most important concerns of human societies. It works because when a nuclear power plant works, it may be released in a few of radioactive nuclei. Although the design of nuclear power plant safety measures possible events are internal, external, rare natural disasters and environmental interactions integration is possible for maximum effect in the design and construction of power plants are also included, but according to environmental regulations, it is necessary during the operation of nuclear power plants, to be also evaluated.In some nuclear facilities, huge amounts of nuclear fuel or energy produced, under certain conditions may lead to the uncontrolled spread of radioactive materials and the risk of severe radiation exposure at risk by nature. Evaluation of radiation to people at several nuclear reactors is always a very important issue. Bushehr's nuclear power plant, like other nuclear power plants in the world, when working, will released a very small amount of radioactive waste in the controlled forms into the environment. Since the construction and operation of the Bushehr nuclear power plant has positive and negative effects, short-term and long-term, direct and indirect impact on the environment of the region and the whole country, the aim of this study is to evaluate and assess, predict and interpret the possible effects of the climate of the South and the Persian Gulf on the environment, public health and ecosystem health. It is inevitable adverse effects identified and as well as the appropriateness of the project's environment.

Research question

• Do Bushehr nuclear power plant can serve in operation as an acceptable safety standards?

METHODOLOGY

The research method was descriptive, according to data documented from official sources, it is attempted that will lead to good results. So those reliable data that have been determined in the final analysis, are available from a reputable

source, as well as books and published research results. Tools and methods for data collection are also data on past research documents, data and organizational documents. In this study, environmental assessment for the Bushehr nuclear power plant operation is considered. Gaussian Dispersion Model was used to determine the plan of pollution radioactive gas released from the Bushehr nuclear power plant. Also, with the aim of describing the environmental assessment Bushehr nuclear power plant, the library method has also been used. Tools and methods for data collection are as well as data on past research documents, statistics, organizational documents.

Environmental problems of nuclear power plants in operation

Most of the methods of electricity generation are exploited even in the new energies or nuclear methods used in a gas turbine or steam turbine cycle. For this reason many of the pollutants will have significant similarities due to the operation of electricity generation. Although many pollutants, especially in the power generation cycle, indirectly or directly, due to fossil fuel consumption are produced that do not exist in non-fossil power plants. At the same time, in the same plants may be other pollutants from the raw materials, the main source of energy or chemicals are used in the production process.Since the majority of our electricity is produced using fossil fuel power plants by the steam, gas and combined-cycle (including steam).

Environmental impact of power plants

Direct effects of power plants

The direct effects of power plants are as follows: the output of the air on human health, agriculture, vegetation and wildlife, increased noise and vibration, changes in hydrology and The quality of surface water and groundwater, toxic effects of Spills and discharges of pollutants, thermal shock to aquatic organisms, the loss of vegetation, changing patterns of water use, population displacement, disruption of local traffic, risks of accidental, increasing demand for infrastructure.

Indirect effects of power plants

Changes in demographic patterns, changes in values and social and cultural patterns, the potential effects of the implementation of power plant projects are as follows:

The construction and operation of thermal power plants will review its negative effects. The effects of construction on the first phase of the land preparation activities, some of these activities include site clearing, excavation, drainage, dredging, making channels, and so on. Meanwhile, a large number of staff the

building can have major effects on local communities, cultural and social.

Units of thermal power plants can be viewed as major sources of output of air pollutants and influenced local air quality and the regions. Sulfur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide and particulate matter by combustion of fossil fuels are depleted in the air. The amount of each of these compounds to the type and size of equipment type, fuel quality and the method is dependent on fuel. The output and distribution in the surface of the earth are dependent on complex reactions between the physical characteristics of the flue, physical and chemical properties outputs, local weather conditions and it depends on the time.

The biggest waste of power plants is mainly related to the cooling water which can go back into the system or into surface water drain. The effects of excess heat must be considered from the surrounding water temperature. Especially if the cooling of the unit is once and fast. Little increase in temperature will be able to change the environment of aquatic plant and animal communities. The amount of water discharged from such projects will be low, but are able to influence the quality of water. For example, discharge or leakage of sewage are caused by accidents. Heavy metals, acids and other chemical compounds are among the waste. The oil spill resulting from the combustion equipment have undesirable effects on water quality.

The global effects of such projects is obvious. Emission can be a cause of acid rain phenomenon of factors. Acid rain, destruction of buildings and monuments and enhance some lake and change aquatic ecosystems, and impose significant damage to forest ecosystems. Combustion of fossil fuels in thermoelectric power plants produce nitrogen oxides, sulfur dioxide and other contaminants can cause and increase the greenhouse effect.

Effects of air pollutants of power plants

1. The transformation of physiological functions such as respiration, oxygen transport by hemoglobin and neural changes can lead to feelings of irritation, burning, itching and also cause decreased visual acuity, causing chronic diseases, resulting in a shortening of life is death. In general, it can be said that there is no concern about the contamination of conventional air pollutants for human health, which have an average rate. Conversely, people with lung disease and other respiratory fitness should be afraid of it.

Air pollution and its effects on human health

Particulate matter and toxic air pollution, largely caused by the body's endocrine (Glands and secretion of hormones) affected and causes a decrease in performance. This impacts not only on the human, but influences wild and domestic animals and interferes with the activity of the gland. Research shows that 50 years ago the Called problem of air pollution in different parts of the world, especially in industrial was introduced, significantly decreased sperm production in men.

MINERAL SALT

All wastewater from the water treatment systems such as the removing ion materials, the lighteners and the wastewater from twigs blown cooling on cooling towers mainly contain sulfates, chloride, magnesium, sodium and potassium salts are known as waste-filled. The effects of sewage are as follows. Increase the solids will be receiving waters. Algae growth of nitrogen and phosphorous are the main factors. Due to high salt, corrosion of the receiving waters will increase. In the case of non-neutralizing and acidic drainage, due to the dissolution of the acid in the soil, find their way back into the groundwater and contaminated the water.

Heavy metals and other toxic chemicals

Waste from chemical cleaning units and air preheater and chimney waste water is containing detergents, retarder and salt, iron, zinc, nickel, silicon, vanadium, nitrates, and metals such as calcium and magnesium. On one of the elements of the known toxic effects, however, depends largely on the pH and concentration of calcium and magnesium in water is to reduce the population growth of microorganisms. Chromium: has a toxic state of aquatic animals and plants. Chromium can reduce at a concentration of 2% milligrams per liter of water, algae growth by half the usual amount. Phosphorus: is one of the most important elements in the receiving water and at the same time the most known of them. Phosphorus is necessary for the growth of biological life even may cause excessive growth of aquatic animals and plants. And nitrate nitrogen, nitrogen as well as phosphorus is necessary for the growth of aquatic animals and plants known as a food material. Aerobic bacteria in the environment can be oxidized ammonia nitrogen into nitrites and nitrates. Also nitrites are easily oxidized to form nitrate. Nitrate concentrations in surface waters is about 5 mg per liter. Cleaning resulting in the foaming waters are shallow acceptor Oxygen exchange can be prevented between water and air. Chloride and copper sulfate can cause color and odor in the water and the bacteria also can cause

growth retardation. Organic matter, and produce bad smells and toxic gases such as Mercaptan, etc.

EFFECT OF HEAT

Waste heat from the exhaust cooling system with heat loads are high and when the sea, lakes and rivers are discharging severely disrupt the ecological balance, the effects of this treatment can be summarized as follows: oxygen soluble in water decreases, so living organisms that require oxygen is in jeopardy. Biological organisms will have series of high temperature, especially increased breathing and decreased dissolved oxygen in water. The growth of aquatic plants will be faster. Sensitivity of aquatic animals to toxic substances will increase more than the premise. It may cause fish lay eggs prematurely, then there will not be fish food nutrition.

EFFECTS OF OIL

This waste includes contaminated water and fuel oil power plants from different parts of the plant and motors is, when these materials enter the receiving waters, are placed under a series of physical, chemical, biological changes. Such as spread by water or wind action, dissolving, beingemulsified, the dispersion of droplets, sedimentation, chemical oxidation. Microorganisms use the oil as food material. It can also disrupt the balance of ecological environment treat will be caused by the spread of toxic organic and threaten human health. One of the most important biological effects of oil discharge relates to Skarl containing PCB and the effects of environmental sustainability in the environment that are hazardous to humans and animals.

The effects of sanitary waste

It is expected that biological organisms in the faeces cause numerous diseases that is transferred by spreading most of the water, the transfer of water or by direct entry into the alimentary canal by drinking and washing dishes or from contact with water or through insect vectors will be water. The waters of bacterial diseases such as cholera, typhoid, diarrhea and parasitic and viral prevalence find. (Ganjizadeh, Iran, 2003)

Positive and negative effects of nuclear power generation on the environment

The effects of nuclear radiation on the environment

The use of nuclear energy for peaceful purposes, as well as the benefits for countries brings many, many environmental health risks and may also be sought with. Especially when the use of nuclear energy rolling out of control and safety rules and relevant security are not met, any failure or negligence in this regard, will bring irreversible effects to

human health and the environment. A nuclear explosion unintended or deliberate leakage of radioactive material from the reactors damaged or worn out nuclear power plants or technology centers, development of radioactive contamination during transportation, handling and storage of nuclear fuel waste and pollution of the environment and people involved will have disastrous consequences. The radiation emitted by radioactive nuclei or explosion resulting from uncontrolled fusion or nuclear fission risks to humans and the environment is known as nuclear hazards.

Risks of radioactive materials

Although nuclear fuel, such as fossil fuels, hazardous gases such as sulfur dioxide, nitrogen oxides and carbon monoxide does not produce, but the nuclear reactions are thousands of times more toxic wastes remain gases than fossil fuels play. Plutonium is the most toxic waste from the uranium element. It is only a millionth of a gram or one part of a million parts a gram of plutonium, if the human skin will reach with skin cancer on that point. If a small amount is deposited in blood into the man's bones and cause bone cancer.

It must be understood that toxic chemicals may cause one or a few days remaining in the body of human illness and subsequent recovery. But, there are long-term toxic effects of radioactive and heavy metals, and may be sick, years after coming into contact with these materials irredeemably diseases such as cancer.

Nuclear energy may have the effect of three types of risk: low immunity power plants and nuclear power generators, toxic waste (garbage) disposal of nuclear reaction and incomplete, the possibility of using nuclear energy countries manufacturing atomic weapons. Unusual use of nuclear energy is mainly risks of nuclear accidents was practical. Such events may result in a nuclear power plant or any other place where radioactive materials are used or stored and shipped. Nuclear accidents can be the result of an accident in a nuclear power plant, atomic bomb or nuclear weapons testing, accidental leaks of radioactive material from industrial or medical devices, or intentional release of these materials in a terrorist operation. As well as the nuclear accident can be too hot because of the nuclear fission reactor that it happens. The nuclear fuel cylinders and other parts of the reactor was damaged and dangerous amounts of radioactive material leak out and pollute the environment. Primarily in the radioactive contamination may be air, water, soil, surface buildings, humans, plants or animals infected radioactive particles. Although much has been said

about the dangers of nuclear energy but so far, despite working in more than 440 nuclear power plants worldwide the number of accidents that occurred in the plant was very small, and we can say that if the use of atomic energy for different tasks is along with the necessary precautions, not only is there a risk than other sources of energy but scientists have shown that the risk is lower than other energy. The need and use of energy in the industrialized nations and developing countries have been faced with an increasing rate. It is estimated that close to 75 percent of global energy consumption will increase in the next two decades. This is while the world is now 64 percent of electricity generated by fossil fuel power plants and nuclear power supplied about 17 percent of the total power produced in the world devoted.

Increasing the use of renewable energy sources and fossil fuels and hazardous pollutants and toxic of them rise to numerous environmental problems, so that the process of global warming, greenhouse gases, the ozone hole, the environmental planet is faced with a halo of ambiguity. This trend continues with growing energy crisis and shortage of fossil resources highlights the numerous environmental problems caused by a tendency toward nuclear energy is growing rapidly. In this section we explain the problems of environmental pollution resulting from fossil fuel power plants, the positive environmental effects of nuclear power generation has been studied.

Effects of nuclear radiation on humans

Exposure to radioactive radiation may be genetic or physical damage. Radioactive effects may remain hidden for several years. This effect, depending on the amount of radiation absorbed by the body (the amount of energy actually absorbed by the tissues), the type of radiation, the source of the call and change the duration of the negative effects, such as mild redness to severe effects, such as cancer and death. Contact with high levels of radiation can cause death in a few days or a few months. Contact can increase lower the risk of cancer or other long-term complications. Precipitation radioactive leak caused the explosion of nuclear weapons or nuclear power plants, radiation subtle combination of natural soil (such as soil containing uranium), and exposure to X-rays, can cause radiation sickness. These substances are generally toxic. These substances are harmful to life. That is in many ways a very high level poisoning and finally, the human body that will survive even if someone poisoned, causing genetic changes occur in a person. This means that the molecules of DNA and

RNA affect and cause mutations or are genetically modified. The main issue that generate radioactive materials, is genetic changes.

Nuclear radiation and environment

Intentional or unintentional precipitation of radioactive nuclear explosions and leaks of radioactive materials, particularly nuclear waste stored or in transit can contaminate soil, air, water and food sources on which life depends on organisms, leave environmental effects and environmental disastrous. Radioactive substances have left physical and genetic effects of on animals. High levels of radiation causes severe diarrhea and extensive skin necrosis, and average values of anorexia, lethargy, vomiting, diarrhea, sepsis and pancytopenia (low blood cell elements). The deaths are very common. In some cases, chronic exposure causes cataracts, birth defects, gene mutations and different types of tumors are abnormal. Plants may also be suffering from radioactive contamination. There is the possibility of mutation in plants of infected areas.

Radioactive effects of seawater

During the operation of nuclear power plants may soon be released into the environment from radioactive nuclei. Direct or indirect release of radioactive nuclei can enter the environment water and after dilution by the water flow cause the transfer of dispersed radioactive material to human. Therefore, it is necessary in the operation of power plants, water and aqueous coating plants to explore their environment. In continuous monitoring, periodically water and its deposition is sampled in certain parts of the study area and background radiation and radioactive contaminants are determined that may have leaked.The collection of data from the study area is necessary to properly organize and to notify users come to the decision-making process and support management control plant operation. According to what was told to design and build a hydrological information system, one of the tools required for the nuclear power plant during its operation.The results of the monitoring and verification can be an indicator of a lack of radioactive contamination in the environment and confirms the environmental operation and safety conditions is acceptable for the continuation of the activity of the plant.In continuous monitoring, periodically water and deposits are sampled in certain parts of the study area (Plant and surrounding area) and background radiation and radioactive contamination may have leakage are appointed.The collection of data and hydrological parameters in the study area that it is necessary to be properly

organized and to notify users come to the decision-making process and support management control plant operation.According to what was told to design and build a hydrological information system is one of the tools required for the nuclear power plant during its operation.

Regularly monitoring the levels of radiation in Bushehr power plant

Bushehr power plant emissions are not out of the main chamber and some filters are considered to increase plant safety factor. Bushehr power plant and its radiation have no risk to families living around the plant, and also regularly monitoring the Bushehr sky, he said: Even Iran's neighboring countries can also use environmental monitoring systems.

Monitoring Bushehr nuclear power plant

One of the basic approaches to keep the environment safe, is continuous monitoring of emissions that Bushehr nuclear power plant will do two radiological and non-radiological monitoring in this field are continuously available information (portable). In monitoring the effects of radiological evaluation, the main pollutants iodine, cesium Cs, strontium Sr 90, alpha and beta of Total water (drinking water and sea water), soil, air, plants, fish (all areas Sturgeon fish catching stations), feed and milk has occurs in a radius of 30 km and 70 km radius of the environmental gamma dose, nuclear power plant. Based on observations and reports on the monitoring are done according to the International Atomic Energy Agency standards. As well as in monitoring the effects of non-radiological parameters NO, Ph, DO, CO, COD, BOD, hard water entering the plant and its output to the sea, measured in privacy of underground water nuclear power plant. Knowing the moment the environmental conditions existing nuclear power plant operations is therefore important issues in standard labs and three mobile stations continuous measurements to determine the amount of iodine in the air, radioactive substances and AIROSOL been launched. Also, waste management, green space and ISO14000 for the Bushehr nuclear power plant is also underway.

Bushehr nuclear power plant's nuclear waste disposal is in accordance with international standards

Based on program developed waste and nuclear waste is buried according to international standards and criteria for the safety of Bushehr nuclear power plant. Nuclear waste in the plant are classified to levels low, medium and high standards Russia and to spend any steps necessary to secure and their burial. In the future, all

the waste in terms of safety and environment will be reviewed and controlled and there is no concern for the burial. Part of the water used in the Bushehr nuclear power plant, which dates back to the sea at this stage, all the safety standards for the health control of water will be returned to the sea. Landfill sites designed and predicted in accordance with the standards of safety systems that are maintained at the average level waste stored at the site.

CONCLUSION

Fossil power plant with the same capacity of Bushehr nuclear power plant released annually 70 million tons of pollutants in the air while the level of environmental pollution Bushehr nuclear power plant is very low or even zero because the interaction of the nuclear power plant and produces no heat combine with oxygen.From the other hand, after 10 years, the cost of energy production in nuclear power plants is far less than Dungeons power plants, fossil fuels because the life of a maximum of 20 years. While nuclear power plant is 70 years old so this time, spending the first 10 years, which is more expensive is prorated and the total nuclear power plant is economically more affordable.

Nuclear power plants are extremely safe because the radiation in different ways and is controlled at different levels of radiation in the heart of the reactor. In other words, the amount of radiation that people working in the plant or neighbors they receive much lower than that of a normal person, for example, will receive an air flights. However, in the case of nuclear power plants should anticipate the worst situations and events take place accordingly, if there are areas around nuclear power plants or to predictions made at the time of the accident and evacuation areas or before any event will be evacuated from the population.

According to the regulations establishing strict nuclear safety in all nuclear facilities are designed with the highest standards and technologies at all stages of the construction, commissioning, operation and disable the nuclear facilities of Iran, is trying danger safety and security of the facility staff, the general public, or the next generation does not threaten the environment.

Accordingly, as a priority, the highest standards of nuclear safety in all stages of design, had been established construction and operation of Bushehr nuclear power plant. Bushehr nuclear power plant designed based on the most advanced and the most stringent international standards.The application of these standards in all phases of plant

construction strong monitoring and Center "safety system" Islamic Republic of Iran by the International Atomic Energy Agency is monitoring the plant safety inspections. Although belonging to the Islamic Republic of Iran's Bushehr power plant, but it is normally a sign of Russia's nuclear industry capacity, therefore, the Russian contractor safety issues observed carefully. In recent years the International Atomic Energy Agency, has been sent several bodies to review the safety aspects to Iran's Bushehr power plant. For example, before the start of the plant, an international team of nuclear safety experts under the auspices of the IAEA, while visiting the plant, examined its safety aspects in accordance with safety regulations, the Agency. The result of this extensive study, was that the Bushehr nuclear power plant, like other modern nuclear power plants around the world, is the highest nuclear safety standards. The report published on the official website of the Agency. In addition, despite the fact that their countries are responsible for the safety of their nuclear facilities, Iran to the International Atomic Energy Agency's Nuclear Safety Regulations all Arts on all its nuclear facilities, including the Bushehr nuclear power plant is committed. In this regard, Iran joining the Convention on Nuclear Safety procedures has begun in the country.

Industrial nuclear industry is extremely sensitive to all the actions and activities Status of nuclear power plants by various agencies are under monitoring; The industry cannot be a plant in operation and unsafe conditions others hid from the eyes of the state, this is true for Bushehr power plant, and it can also ensure that the neighboring countries of Iran in the Persian Gulf, they do not realize the danger of Bushehr nuclear power plant. About the Bushehr power plant accident in the same conditions as Fukushima, Japan, Plant after the earthquake were also affected by the tsunami, we can say because of the special position of the Persian Gulf, after the earthquake, the tsunami is not expected to occur; one of the reasons why this location was chosen for the construction of power plants, Bushehr is geologically suitable location in the Fukushima number of factors that go hand in hand to the event in fact none of the Bushehr power plant is almost not relevant.

Yet, it has been emptied twice in recent years due to security issues, the heart of the Bushehr reactor and fuel has been fully inspected; however, the inspection delayed station set up a few months, but the safety was taken into consideration, the principle

that cause major accidents in nuclear elsewhere.

About automatic safety system of Bushehr power plant, it must be said: If a strong earthquake occurs, there are systems in power plants to omit it from the circuit and shut down the reactor; the opportunity inspected a part of the technical staff. Safety light for plants many security ring is considered if they have any reason does not work, the next cycle will retain safety of nuclear power plants. Then the sea water used to cool plants is released at a distance of 700 meters on flat concrete substrates until it again reaches the sea in ecological issues and the temperature of the sea environment that isolates, and do not any harm to the fish.

Power safety is of the declared priorities of the Islamic Republic of Iran; because in the event of a power problem at the beginning, this is the Iranian people who will incur losses and damage. So it is natural these plants have a high safety factor. As mentioned, no danger from Bushehr power plant, threatens Persian Gulf countries. The countries of the Persian Gulf Cooperation Council are fully aware of the fact; because Iran's nuclear activities are transparent and by inspectors of the International Atomic Energy Agency, on a regular basis, the inspection.

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