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A Short Review of the Nuclear Energy

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Abstract

Nuclear energy is the energy that comes from the center or nucleus of an atom. Nuclear power is the latest energy source to be used on a large scale. It has tremendous potential to fulfill Increasing demand for energy without environmental degradation. Currently, nuclear fission of some heavy elements makes up the vast majority of nuclear energy in direct service to mankind. In nuclear energy, the bonds that hold atoms together contain a large amount of energy. This energy is needed to generate electricity. This energy can be released in two ways: nuclear fission and nuclear fusion. Nuclear power grew rapidly during the 1960–1975 period in countries such as France, the United States, and Norway. But nuclear power ran into trouble in the 1970s because of public concerns about the radioactive waste produced a problem that discouraged the expansion of nuclear power. In recent years people have come to know about the proper use of nuclear energy and the use and growth of nuclear energy have increased.

Keywords: - *Nuclear Energy, Latest Energy Source, Radioactive Waste Produced, Growth of Nuclear Energy*

INTRODUCTION

Atomic energy is the energy that comes from the nucleus of an atom. The bonds that hold the atoms together hold a lot of energy. This energy must be released to generate electricity. This energy can be released in two ways: nuclear fusion and nuclear fusion. The core of a country's energy demand is that it touches on almost every aspect of nuclear energy policy.

Nuclear reactors operate on stable electric grids, carbon emissions targets, and national security. Atomic energy splits water into atoms in a reactor to turn water into steam, turn turbines, and generate electricity. About 1.4 billion people (20% of the world's population) No access to electricity and 2.8 billion depends on people (40% of the global population) Uses traditional biomass for basic energy needs Such as cooking and heating.

What is the Nuclear Energy?

Atomic energy is the nucleus made up of protons and neutrons, a form of energy emitted from the nucleus of an atom. This source of energy can be produced in two ways: fission - when the nucleus of an atom is split into several parts - or fusion - when the nucleus is joined together. An atom is a tiny unit that makes up all the matter in the universe and energy is the nucleus that holds it together. The dense nucleus of an atom contains a huge amount of energy. The force that holds the nucleus together is officially called the "strong force." Today, nuclear power is used worldwide to generate electricity through nuclear fission, while the technology to generate electricity from fusion is at the R&D stage. The first nuclear power connected to the power plant the power grid in the UK in 1956. The 1960s and 1970. It was a time of unbridled optimism for the future. Nuclear power. In a 1976 publication, International the Atomic Energy Agency has made a global nuclear prediction it has an installed capacity of 2500 Giga-Watt (GW) in 2000. The actual installed capacity in 2000 was only 348 Giga-Watt.

How does it Work?

A nuclear reactor produces electricity in the same way as other power plants. The chain reaction generates energy, which turns water into steam. The steam pressure turns into a generator and produces electricity. In nuclear power plants, nuclear reactors and their equipment typically contain and control a chain reaction fueled by uranium-235 to produce heat through fission. The cooling agent of the heating furnace, usually water, heats to form steam.

When an atom splits, it generates heat. The initial fission process not only generates energy but also initiates a chain reaction between the released neutrons, which in turn generates more energy. Power plants powered by fossil fuels burn coal, oil, or natural gas to generate heat. In a nuclear power plant, heat is produced from split atoms - a process called nuclear fission.

1. Nuclear reactors generate heat which is used to make steam.
2. Steam converts a turbine attached to an electromagnet, called a generator.
3. The generator generates electricity.

Uranium acts as fuel for nuclear reactors. Uranium is an abundant and radioactive material found in most rocks. Uranium generates heat as it breaks down or decays. Fission Hall divides a nucleus into two parts. Each uranium fuel pellet contains millions of uranium nuclei. When these nuclei split, huge amounts of energy are emitted. It generates heat inside the reactor, which is used to generate steam and eventually generate electricity. For more than 60 years, nuclear power has provided the world with reliable electricity. Today, more than 400 reactors are operating in more than 30 countries. Various countries are exploring the use of nuclear energy, especially due to the growing demand for electricity and concerns about climate change.

As part of global power,
At the beginning of 1996 nuclear power was at the top at 17.5%, but
2017 decreased by only 10.3%.

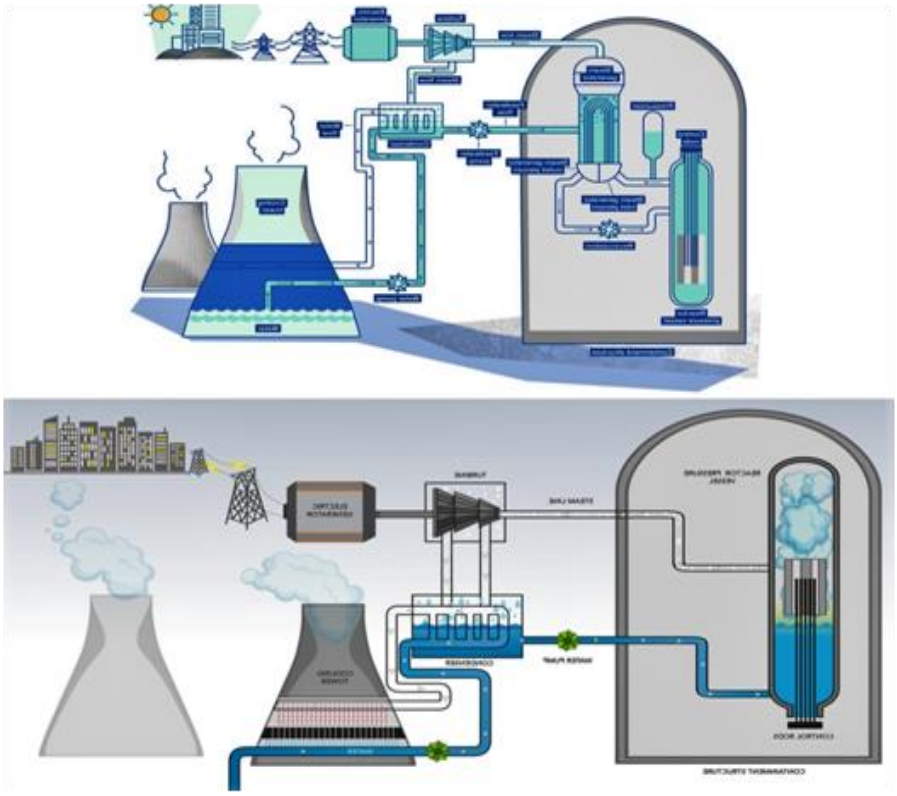

Figure:- 1 Nuclear Energy Work

A Brief History of Nuclear Energy

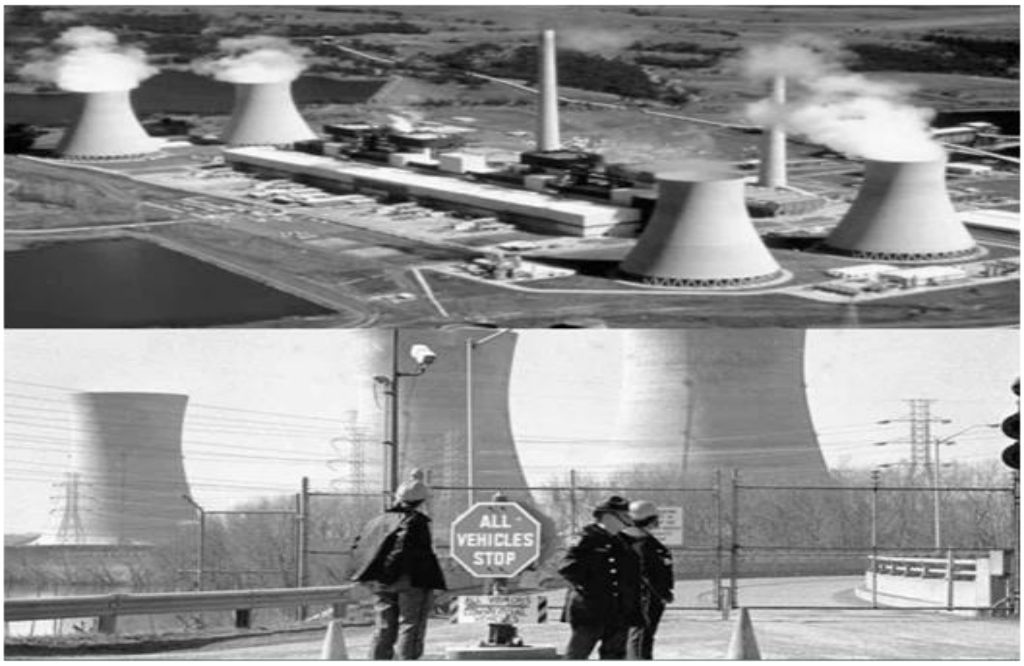

Figure no.2 History of Nuclear Energy

The science of atomic change and atomic fission was developed from 1895 to 1945[6]. Between 1939 and 1945, the focus was on the development of the atomic bomb. Attempts to use nuclear energy as a method to navigate and generate electricity with nuclear energy began in 1945.

Since 1956, the main focus has been on the technological evolution of nuclear power plants. The concept of nuclear energy began in the 1930s when physicist Enrico Fermi first showed that neutrons could split atoms. This was followed by a series of milestones in the 1950s: in 1951 the first electricity was generated from nuclear power at the Experimental Breeder Reactor I in Idaho [11]. The first nuclear power plant was in Obninsk, former Soviet Union in 1954; and in 1957 the first commercial nuclear power plant was installed in Shipping port, Pennsylvania [12].

In 1932, physicist Ernest Rutherford discovered that lithium atoms were "split" by protons from a proton accelerator, releasing large amounts of energy according to the principle of mass-energy equivalence. Rutherford's doctoral student James Chadwick discovered the neutron [13].

Experiments bombarding matter with neutrons led Frédéric and Irene Joliot-Curie to discover induced radioactivity in 1934, which allowed the creation of radium-like elements. In the 1930s Enrico Fermi focused on using slow neutrons to increase efficiency. Experiments bombarding uranium with neutrons led Fermi to create a new transuranic element, called hesperidia. In 1938, German chemists Otto Hahn and Fritz Stresemann, along with Austrian physicist Lise Meitner and Meitner's nephew, Otto Robert Frisch, experimented with products of neutron-bombarded uranium and investigated Fermi's claim, they determined that relatively small neutrons split the nucleus of a massive uranium atom into two roughly equal pieces.

Nuclear technology uses the energy released by splitting atoms of certain elements. It was first developed in the 1940s, and research during World War II focused primarily on bomb development. In the 1950s attention shifted to peaceful uses of nuclear fission, controlling it for electricity generation. Civil nuclear power is now over 18,000 reactor years old and nuclear power plants are operating in 32 countries worldwide. Many other countries rely partly on nuclear power, through regional transmission grids; For example, Italy and Denmark get about 10% of their electricity from imported nuclear power. When the commercial nuclear industry began in the 1960s, there were clear boundaries between the Eastern and Western industries. Today, separate American and Soviet spheres no longer exist, and the nuclear industry is characterized by international trade.

A reactor under construction in Asia today may have components supplied from South Korea, Canada, Japan, France, Germany, Russia, and other countries. The use of nuclear technology extends beyond low-quality provisions. - Carbon energy. It helps control the spread of disease, assists doctors in diagnosing and treating patients, and powers our most ambitious missions for space exploration. This diverse use places nuclear technology at the heart of the world's efforts to achieve sustainable development.

Advantages of Nuclear Energy

Nuclear energy is clean and it provides pollution-free energy with no greenhouse gas emissions. Contrary to popular belief, nuclear plant cooling towers emit only water vapor and thus do not release any pollutants or radioactive materials into the atmosphere. Compared to all the energy options at our disposal today, many

experts believe that nuclear power is one of the cleanest sources. Nuclear energy has many advantages and everyone needs to know about this energy concept. Knowing the benefits of nuclear energy will help you decide how we can benefit from this energy and whether it will be good for our planet in the future. Below are the advantages of nuclear power:

Nuclear protects national security

Figure: - 3 Nuclear National Security

Environmentally Safe

Figure:- 4 Environmentally Safe

Nuclear power stands out as an environment-friendly energy source. It does not produce greenhouse gases. Nuclear power is cleaner energy by bombarding uranium with neutrons as opposed to burning fossil fuels.

Produces Nuclear reactors do not directly produce carbon dioxide emissions, and nuclear power plants do not produce significant amounts of greenhouse gases or any other polluting gases.

This energy source is safer and more affordable than fossil fuels like coal and gas. It is one of the cleanest and cheapest energy sources on earth.

Low-Cost Energy

Although the initial cost of building nuclear power plants is high, they are relatively cheap to generate energy and their operating costs are low. Nuclear power has the advantage of being one of the most affordable energy solutions available. The cost of generating electricity from nuclear energy is much lower than the cost of generating energy from gas, coal, or oil. Also, nuclear power does not experience the same price fluctuations as traditional fossil fuel energy sources such as coal and natural gas. Because of that, the price of nuclear power can be well predicted in the future. That price may stay low, or even lower, as technology advances.

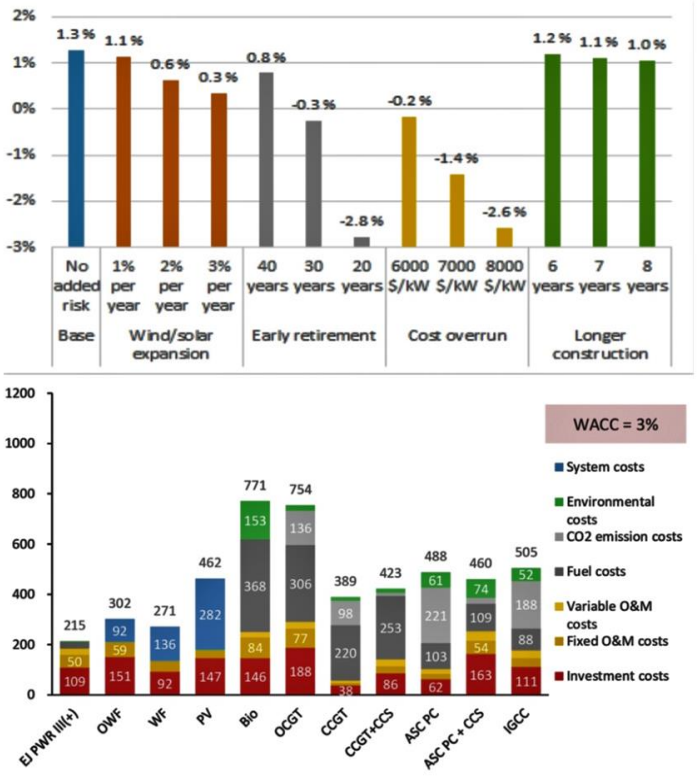

Figure:- 5 Nuclear Low-Cost Energy

A Reliable Source of Energy

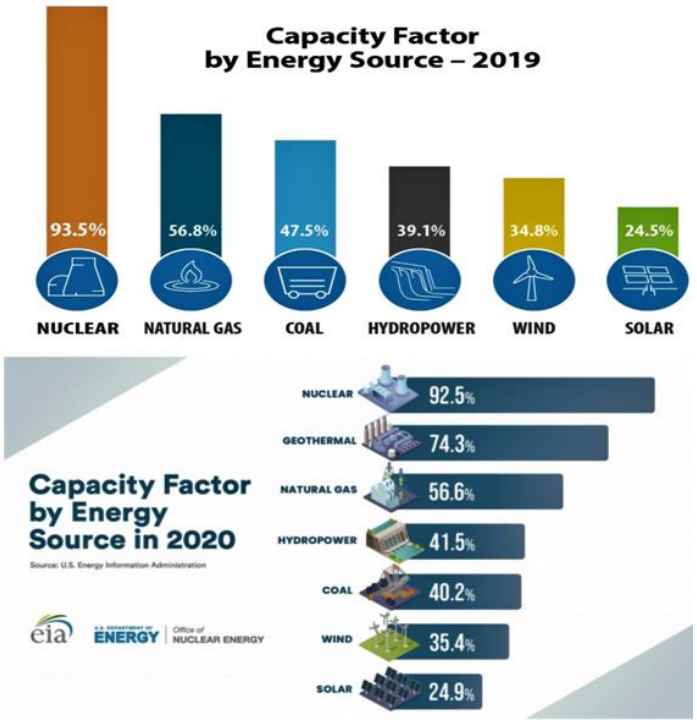

Figure no.6 Nuclear a Reliable Source of Energy

The biggest advantage of nuclear energy is that it is a reliable source of electricity generation. While some energy sources are dependent on weather conditions, such as solar and wind power, nuclear power has no such limitations. Nuclear power plants are largely unaffected by external climatic factors and produce predictable and stable energy production. A nuclear power plant can produce nonstop power and you don't have to experience any lag in power generation.

It Has a High Energy Density

In our list of pros and cons of nuclear power, this one is quite shocking. It is estimated that the amount of energy released in a nuclear fission reaction is ten million times greater than the amount released when burning fossil fuels. Therefore, the amount of nuclear fuel required in a nuclear power plant is much less than in other types of power plants. Able to do more with less cost using nuclear energy. A nuclear power plant can generate thousands of megawatts of electricity using nuclear energy.

Disadvantages of Nuclear Energy

Nuclear power is a promising alternative and reliable energy resource for future electricity needs. However, while there are many advantages to using nuclear power, there are also many negative effects of nuclear power. Especially its

environmental impact in the future. The negative effects are discussed below.

Construction is Expensive

Nuclear power plants are incredibly expensive to build—and the costs keep rising. Between 2002 and 2008, the expected cost of constructing nuclear plants ranged from $2-$4 billion to $9 billion and, often, exceeded their cost estimates during construction. A recent virtual test in the U.S. estimates $3.5 billion to $6 billion in addition to huge additional costs to maintain the reactor facility. Nuclear plants must allocate funds to protect the waste they generate and keep it in cool structures with safety procedures in place. All these costs make nuclear power quite expensive.

Figure no.7 nuclear construction is expensive

Impact on the Environment

Figure no.8 nuclear impact on the environment

While nuclear power plants emit zero carbon, nuclear power has a substantial impact on the environment, mainly through mining and water discharge. Uranium used to produce nuclear energy has to be mined. And because of this uranium, there is a negative impact on the area around the mine. Uranium mining in particular is known to release arsenic and radon. But it has a negative impact on the health of those living around uranium mines, and nuclear power plants have a greater impact on the environment through the waste they produce. Uranium mining and enrichment is not an environmentally friendly process. So it can be said that nuclear energy has harmful effects on the environment in many ways.

Nuclear accident

Nuclear power plants have very strict safety measures. However, accidents can happen no matter how careful you are. A meltdown at a nuclear plant can have a catastrophic effect on the surrounding area. Despite all the safeguards in place at nuclear plants, meltdowns can occur for a variety of reasons, which can have harmful effects on the environment and its inhabitants. The 1979 Three Mile Island accident The Chernobyl accident, which occurred on 26 April 1986 at the Chernobyl nuclear power plant in Ukraine, was the worst nuclear accident in history. Then there was the recent accident in Fukushima, Japan in 2011. Its harmful effects on humans and ecology are still visible today

Figure no.9 nuclear accident

Limited Fuel Supply

Nuclear power can have some important advantages and disadvantages, one of the important considerations being that nuclear power plants are heavily dependent on thorium and uranium for power generation. Before the supply of thorium and uranium is exhausted, a nuclear fusion or breeder reactor has to be built; otherwise, power generation will not be possible. Currently, nuclear power is only an expensive short-term option for power generation due to resource depletion.

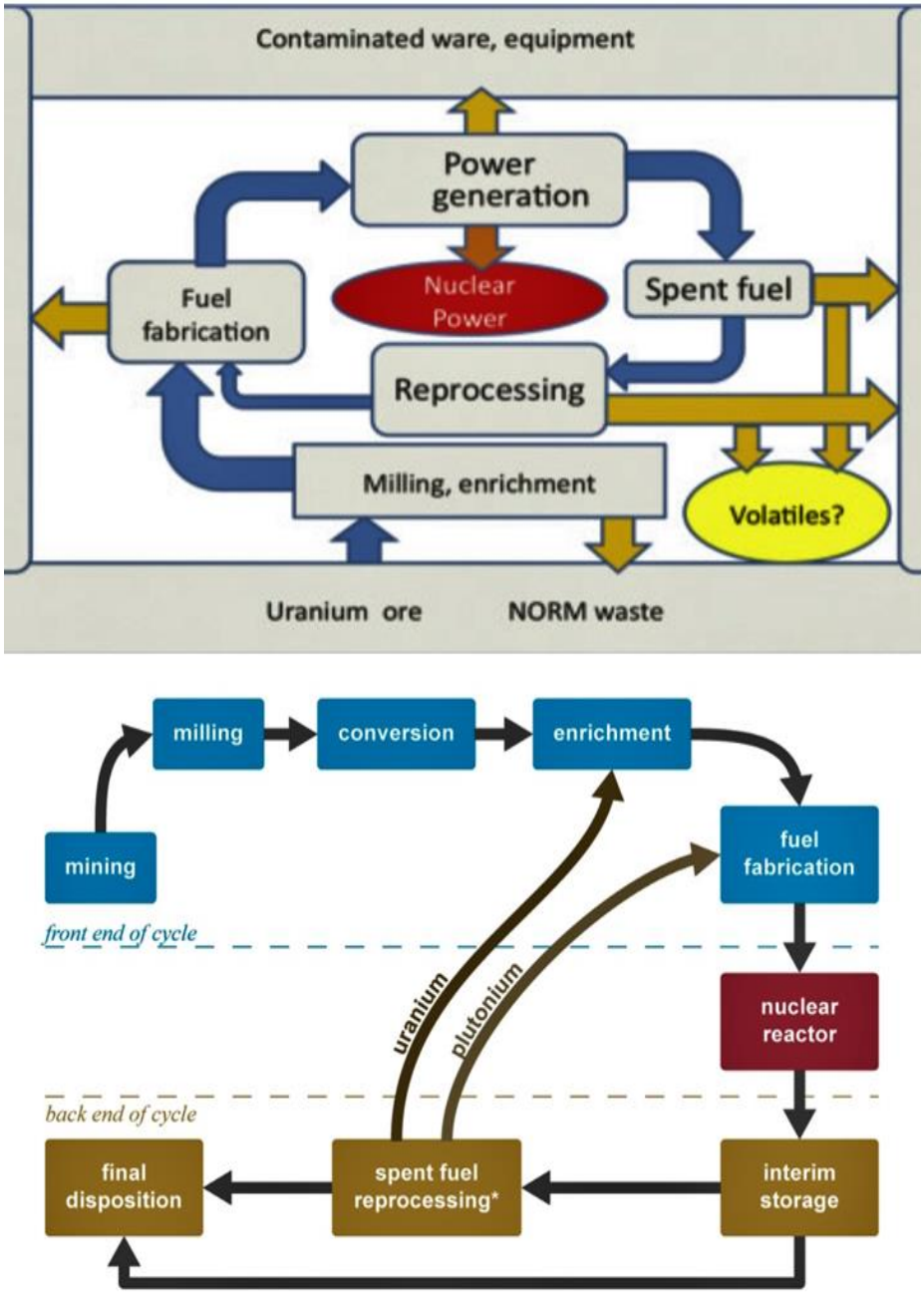

Figure: - 10 Nuclear Fuel Supply

Radioactive Waste

Figure:- 11 Nuclear Radioactive Waste

While producing nuclear power does not release harmful greenhouse gases into the air, nuclear power plant waste remains dangerously radioactive for thousands of years after generation, which must be stored safely so that it does not contaminate the environment. A nuclear power plant produces 20 metric tons of nuclear fuel per year and with it comes a lot of nuclear waste. If you consider every nuclear power plant in the world, you'll see that number jump to about 2,000 metric tons a year. Storage of radioactive waste is an important concern and cost for nuclear power plants.

There is no way to destroy nuclear waste; the only current solution is to seal and store it deep underground. As technology improves, it is expected that better ways of storing radioactive waste will be developed in the near future.

CONCLUSION

Although nuclear power cannot completely replace fossil fuels and become the only sustainable energy resource, it can play an important role in decarburizing power generation. Nuclear power is a major low-carbon-emission energy source

for the world's electricity generation and is expected to remain so for the foreseeable future. However, nuclear power is certainly safer and more reliable than other energy sources, including hydro, wind, solar, natural gas, and even coal. Although we are facing significant challenges that are hindering the possibility of further development, nuclear power must be developed as a potential carbon-free energy source to mitigate future problems of climate change and other environmental concerns.

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