

## **Nuclear Energy From Current Perspective: A Short Review**

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**Abstract:** A country's growth and wellbeing need to have reliable and secure energy supplies at a decent cost. Nonetheless, some people fail to recognize the importance of energy and take it for granted because they are unaware of the impact of energy sources on their daily life. As the globe battles to restrict carbon dioxide and green gas emissions and deal with climate change, nuclear energy begins to catch everyone's attention. Climate change and diminishing fossil fuel supply have sparked a nuclear renaissance. This paper discusses how nuclear power benefits the industry and country development.

**Keywords:** Nuclear Energy, Industry, Radiation

### **1. Introduction**

Energy is essential to the way we live, and having access to reliable and secure energy supplies at affordable costs is vital to a country's prosperity and welfare. Whether in the form of oil, gasoline, or electricity. Nonetheless, specific individuals still fail to understand the importance of energy and take this luxury for granted since they are unaware of the impact of electricity on their lives. After being solely reliant on oil and gas for more than decades, developing countries like Malaysia have begun to recognize the need to include renewable energy in their energy mix and have evaluated their energy policy regularly to ensure long-term energy supply and security.

Nuclear energy begins to grab everyone's attention as the world battle to limit carbon dioxide emissions and green gas emissions and deal with climate change. There is a nuclear renaissance underway, fueled by climate change and decreasing fossil fuel supplies. Nuclear reactors are being considered by many fast developing countries, and developing countries like Malaysia, Thailand, Vietnam, and Indonesia have all lately revealed their intentions on nuclear energy as substitute energy for their main power to generate electricity. Hence, they announced their nuclear plans.

Nuclear energy has been around for decades and is a common source of energy in fast developed countries, for example France and the United States of America [5]. According to the World Nuclear Association, France's 59 nuclear reactors provide 75% of the its electricity, while South Korea has around 20 nuclear power facilities that provide 40% of its electricity. Nuclear energy has long been

seen to be the only way to fully replace fossil fuels, which currently generate 85% of the world's energy. According to the Environmentalist of Nuclear Energy, the combustion of fossil fuels emits around 30 billion tons of carbon dioxide into the atmosphere each year. In contrast, nuclear reactors emit nearly zero carbon dioxide [6][7].

Looking back to all the facts and information about the benefits of having nuclear energy to the country, the government should understand the needs of developing their nuclear power plant to manage their electric supply in the future successfully. Hence, the nuclear industry's needs also play an essential role in maintaining their development and progress.

## **2. Nuclear in Malaysia**

Malaysia has recently announced its nuclear plans as more developed countries are starting to see the benefit of nuclear energy as their main power to supply electricity [2]. In July 2009, the government of Malaysia had agreed to include nuclear power as alternative energy in the country's energy policy. This is owing to the knowledge that current energy resources are insufficient to supply beyond 2030. The present leading energy is based on natural gas, coal, and hydropower. Due to decreasing national oil supplies, the oil will no longer be a decent choice for energy generation. Malaysia is predicted to become a net oil importer by 2030, meaning Malaysia must buy more oil from other countries. This will affect our economy as the oil price could be more and more expensive in the time ahead.

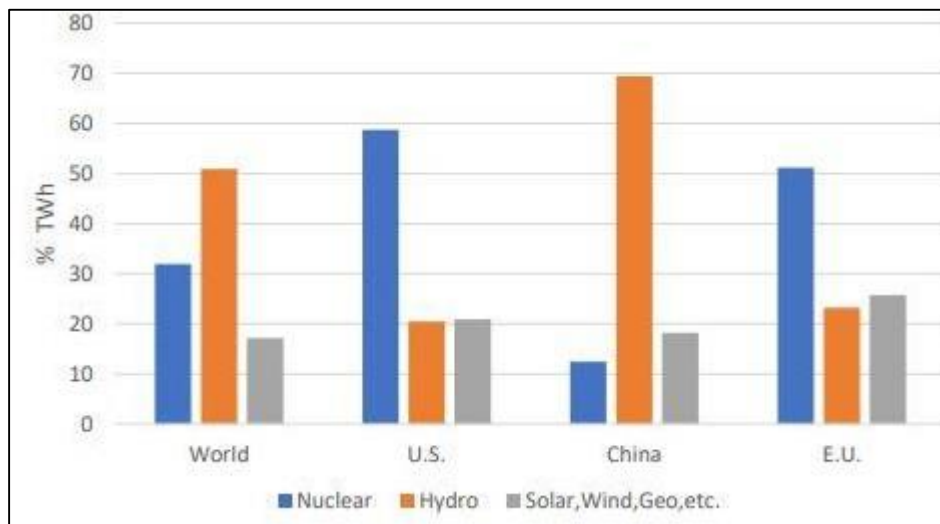
It is good that certain countries have developed an interest in using nuclear energy as their alternative energy. Still, for some reason, there are huge problems that need to act immediately, especially to those developing countries with expertise in nuclear power. The main problem has always been ways to handle nuclear waste disposal, followed by the requirement to decommission the NPP once it is no longer operational. Both are costly and difficult concerns that nuclear-powered countries have failed to address effectively. Hence, if Malaysia wants to continue making nuclear our main energy supply, specific issues need to be addressed..

The expected cost of nuclear power is between US\$0.15 to \$0.21 per kWh, while solar is expected to cost around \$0.20. Moreover, the nuclear cost is expected to increase while solar decreases in the following decades. Plus, solar power does not have the same issue as nuclear power in terms of handling, disposal, security risks, hazardous, and high capital expenditures. This shows that Malaysia is far from becoming a country that uses nuclear energy as its primary power supply. Due to the fact we lack expertise, the cost of maintaining the nuclear industry is high maintenance.

## **3. Carbon Free Industry**

A country needs to expand its energy access to maintain its development. However, to expand energy access while dramatically lowering greenhouse gas emissions that cause global warming and climate change is one of the most pressing concerns facing humanity in the 21st century.

Electricity will continue to be generated mostly from a mix of fossil fuels, hydropower, variable renewables such as solar and wind, and nuclear energy soon. Nuclear energy currently provides around 11% of the world's electricity. It accounts for a significant portion of all low-carbon electricity generation in the United States, Europe, and the rest of the globe, as shown in Figure 1 [8][9].



**Figure 1: Zero carbon electricity source in several major economies and worldwide**

Aside from the fact that it is low-carbon, nuclear energy has other advantages. It decreases air pollution connected with energy generation, contributes to fuel diversification and grid stability, has a small environmental footprint, and offers well-paid jobs. These advantages are important in certain situations; for example, nuclear energy may be appealing in areas with insufficient land or suitable weather patterns for large-scale renewables deployment, or in countries that want to reduce coal use to improve air quality or are concerned about energy security and reliability.

#### 4. Materials development

The economics of nuclear power stations rely heavily on their structural materials. Nuclear materials are divided into two categories which are nuclear fuels and nuclear structural materials. Fuel burnup has historically increased as the performance of materials used in reactor fuels, reactor core components, and reactor vessels have improved. The structure of the nuclear power plant must be made of materials that have long life span and will last a long time in nuclear reactors that are exposed to hostile environments and aggressive media during operation. These are examples of the characteristic of the material structure: good corrosion resistance, low hydrogen absorption, fracture resistance, and good thermal conductivity [10].

Hence, there should be a continuous effort of producing and developing new materials that can withstand and tolerate harsher irradiation environments and greater temperatures allowing for higher burnups. Thereby, Indira Gandhi Centre for Atomic Research (IGCAR) and Mishra Dhatu Nigam Limited (MIDHAN) have collaborated to create and manufacture new core materials D91 9Cr1Mo variations, and so on in MIDHANI. At the same time, MIDHANI has developed new steels like Maraging 400 and modified 430 SS, etc. Prove that RND and industry must work together to continue the development of nuclear materials. Past research can be the key to future development.

#### 5. Nuclear expertise

Undoubtedly, the industry will demand qualified nuclear science and technology expertise in the coming decades. In all circumstances, a high level of competence will be necessary to maintain high performance in operating present nuclear facilities [4]. Plus, different skills will be required to develop new projects or new ways for the new industrial customers.

The industrial needs expertise that knows the current and past nuclear technology based on their country. This is because developing countries like Malaysia are still not used to nuclear energy as a substitute for renewable energy. Different country has different approach to nuclear technology.

However, because global trends in access to qualified knowledge in nuclear sciences and technologies are similar, effective effort must be done as soon as feasible to predict difficult situations and ways to overcome them.

The main problem in countries that strongly used nuclear as their main power supply, for example, France, is primarily the relative aging of the human workforce, as well as the ability to maintain previous knowledge and replace technical expertise at a time when all technology companies are experiencing a significant decline in the number of new entrants in all fields of science and engineering [3].

Moreover, this problem can be supported by the fact that this phenomenon is noticed concurrently in research laboratories, among the employees of the safety authorities, and, more broadly, in all office involved in the nuclear decision-making process. Internal training through enterprise universities, auto-formation, tutoring of young scientists by seniors, and knowledge preservation programs is part of the solution to this shortage of expertise and human resources for the nuclear industries.

However, the more practical solution is through collaboration between universities and the nuclear industry to attract more people and teach the community about nuclear energy's importance for the country's development. Technical universities, engineering schools, and research laboratories are needed to promote science and technology among the community. Not to forget a constant recruitment policy that industry needs for the development of expertise and manpower.

## 6. Conclusion

Based on the findings from this study, we can conclude that even though nuclear has proven that it can be the only way to 100% replace our current energy resource. There are still many ways to take action on developing nuclear energy in a country. However, as technology begins to grow and people begin to understand the importance of nuclear energy, it is a guarantee for the nuclear industry and other industry sectors to grow.

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