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NUCLEAR ENERGY IN THE FACE OF GLOBAL WARMING

Introduction

Today we are facing the biggest problem that threatens humanity – the global warming. Direct observations made on and above Earth's surface show the planet's climate is significantly changing (Fig. 1).

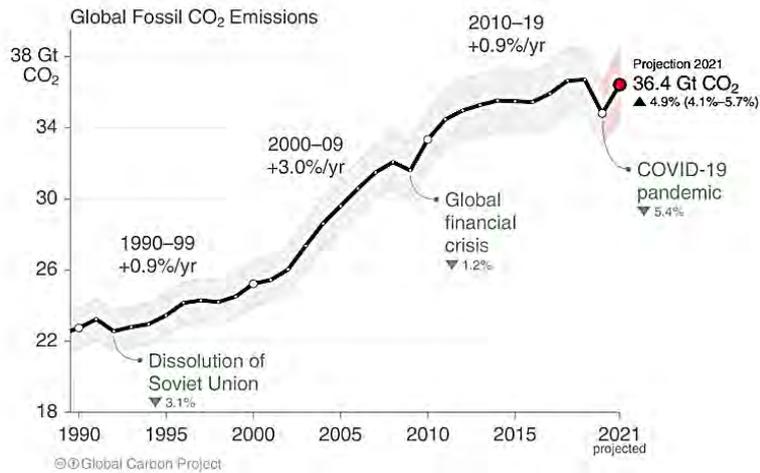


Fig. 1. Carbon dioxide (CO₂) emissions from the burning of fossil fuels for energy and cement production [1]

Human activities are the primary driver of those changes. We all realize that we cannot dispense with energy. With progress and development, we have reached today that energy sources have become the source of both security and devastation. Nuclear power stands as one of the best an alternative so far in the face of this danger. Does our need for energy drive us to increase global warming so that the risks will return to humanity? Is nuclear energy suitable to face global warming at the lowest costs and high efficiency? These questions require additional analysis and discussion.

Achieving zero carbon emissions

Many countries have introduced targets to achieve net zero emissions by 2050. Therefore, concerns will increasingly turn to what it would mean for the energy sector globally to reach net zero emissions by 2050. Countries will seek to find the best sources of energy to achieve the required, under the possible capabilities.

It is worth noting that when calculating the cost of construction, a station, we take into account the losses that will result from this source (Table 1).

Table 1. Some issues of energy sources

	Obstacles)required for the location(The impact it creates on the envi- ronment
Nuclear Plant	Need a water source	biodegradable nuclear waste
Natural gas	-----	CO ₂
Wind energy	Need a wind source	-----
Solar power	Need a sun source	Non-biodegradable plastic waste

In case of CO₂ emission, a forward-looking study states, based on the projected cost provided by the participating countries to operate these plants (fossil fuel plants, nuclear power and renewable sources) in 2025, which assumes moderate carbon costs of USD 30 per ton of CO₂.

Cost based on Low-carbon generation

The costs of generating electricity for low-carbon generation technologies, including nuclear, are declining and are increasingly lower than the costs of generating conventional fossil fuels. With assumed moderate emissions costs of \$30/tCO₂, their costs are now competitive. Thus, deployable low-carbon nuclear power remains with the lowest expected costs. Only the cost of some other sources may be less expensive such as large aquifers can offer a similar capacity but they remain highly dependent on natural endowments and become an isolated case for some countries (Fig. 2).

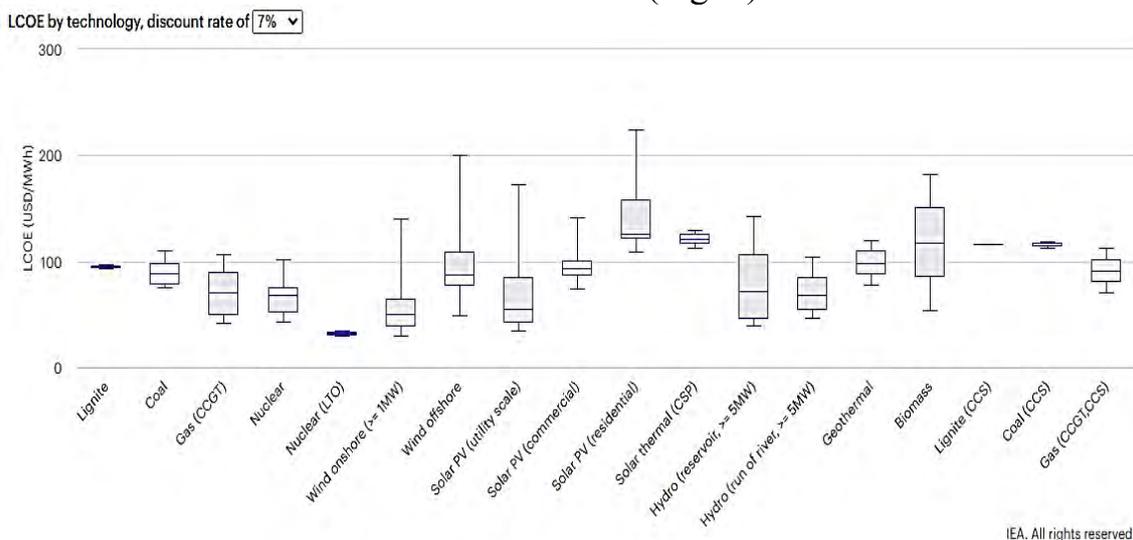


Fig.2. Low-carbon generation is becoming cost competitive [2]

Costs based on local conditions

Costs for all technologies can vary significantly by country and region. In addition, the share of a technology in the total production of an electricity system makes a difference to its value, load factor and average costs (Fig. 3). In the United States, gas-fired power plants benefit from the expected low fuel prices in the region, while in China and India, utility scale solar photovoltaic and onshore wind are the least-cost options in both countries. Renewables energy still have higher costs than fossil fuel- or nuclear-based generation in some countries (in this report: Japan, Korea and Russia).

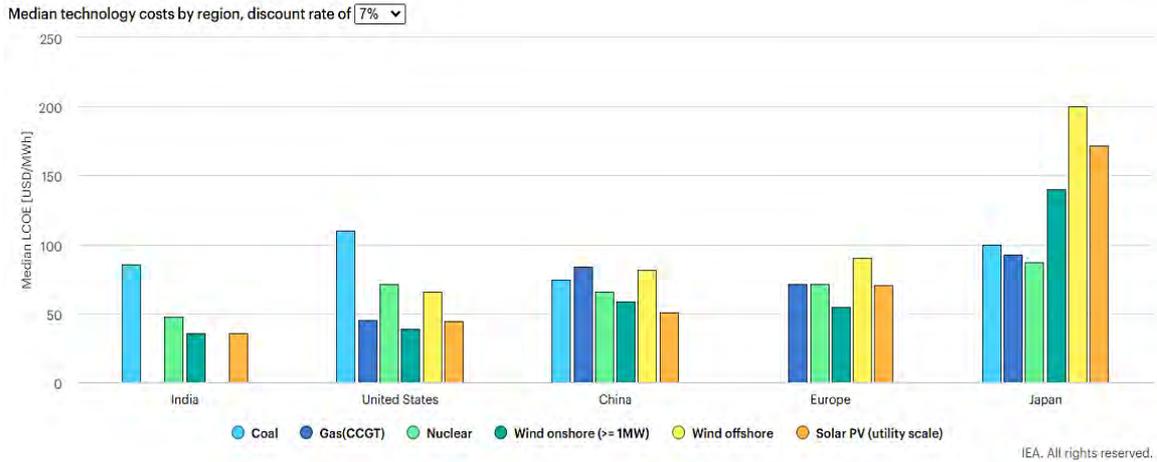


Fig. 3. Costs by region [2]

The cost of renewable energy sources such as wind and solar energy may decrease with an increase in their share in the energy supply, but they remain sources restricted by nature and the remaining sources are valid for some regions only. The cost of nuclear energy sources decreases with their ability to spread without restrictions or excessive scaling, in addition to their high efficiency.

Decrease Costs of NPP based on lifetime extension

The cost estimates of long-term operation of nuclear plants, which represents large-scale renovations to enable safe operation beyond the originally specified life, i.e., utilizing existing facilities and infrastructure, significantly reduces costs compared to building new plants (Fig. 4.).

Advantages of Nuclear Energy:

1. Clean energy source. Nuclear energy is one of the largest sources of clean energy in the United States. Each year it generates approximately 800 billion kilowatt-hours of electricity and produces more than half of the country's zero-emission electricity. This avoids more than 470 million metric tons of carbon each year, which is equivalent to removing 100 million cars from the road.

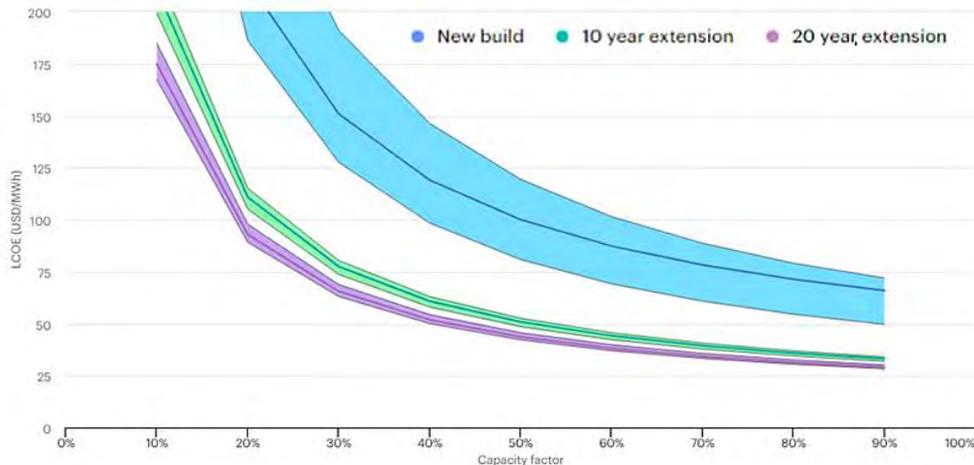


Fig. 4. Costs of NPP based on lifetime extension [2]

2. Large power capacity. Fully combustion of 1 kg of uranium enriched 4% releases energy equivalent to that obtained because of burning about 100 tons of high-quality coal or 60 tons of oil.

3. Reusability. As a result, fissile material (U-235) does not burn completely in nuclear fuel and is therefore reused after regeneration. In the future, it is possible to develop full combustion and transition to a closed fuel cycle, which means that no waste will be generated.

4. Economic growth. The construction of nuclear power plants provides economic growth and creates new jobs, as well as the growth of scientific research and intellectual potential.

Conclusion

There are no ways to obtain energy that are not associated with the risk of harming the ecosystem, but the choice is made on the least harmful sources and with appropriate efficiency. The analysis shows that nuclear energy is one of the most effective sources against global warming and climate change. The electricity produced from long-term nuclear operation by way of life extension is very competitive and is still the least expensive option for low carbon generation (when compared to building new power plants).

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