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The Cost of Energy: an evaluation

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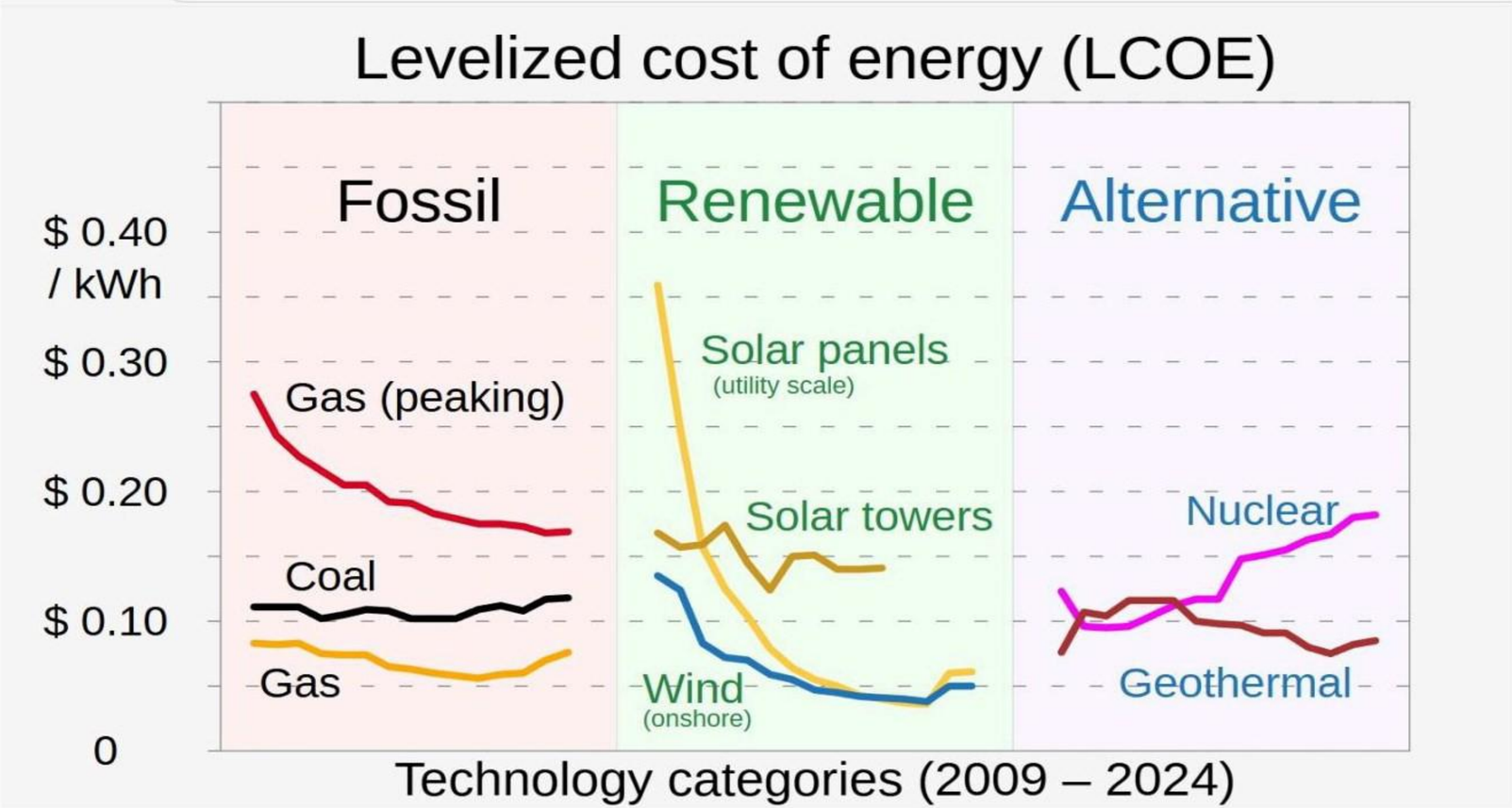
- ***The evaluation of the cost of energy has recently developed new techniques, which take into account as much as possible the "real cost", including the entire life cycle.***
- ***Renewable energies, in this century, have become the cheapest way to produce electricity.***
- ***This short analysis deals with the costs of generating electricity from different sources, analyzing metrics such as the levelized cost of electricity and the factors that influence costs.***



- Levelized Cost of Energy (LCOE) is a measure of the average net cost of generating electricity over time. It also requires consideration of non-financial costs. The LCOE is calculated as the net present value of all costs divided by total energy output.
- The LCOE is considered the most appropriate means to evaluate the costs of an electricity generation project, considering its entire life cycle, “from cradle to grave”.
- Renewable sources increasingly benefit from economies of scale and their convenience compared to fossil fuels and nuclear energy is already evident today and will tend to increase in the future.

French LCOE in €/MWh (2017)

Technology	Cost in 2017
Nuclear (with state-covered insurance costs)	50
Nuclear EPR	100[123]
Onshore wind	60[123]
Solar farms	43.24[124]

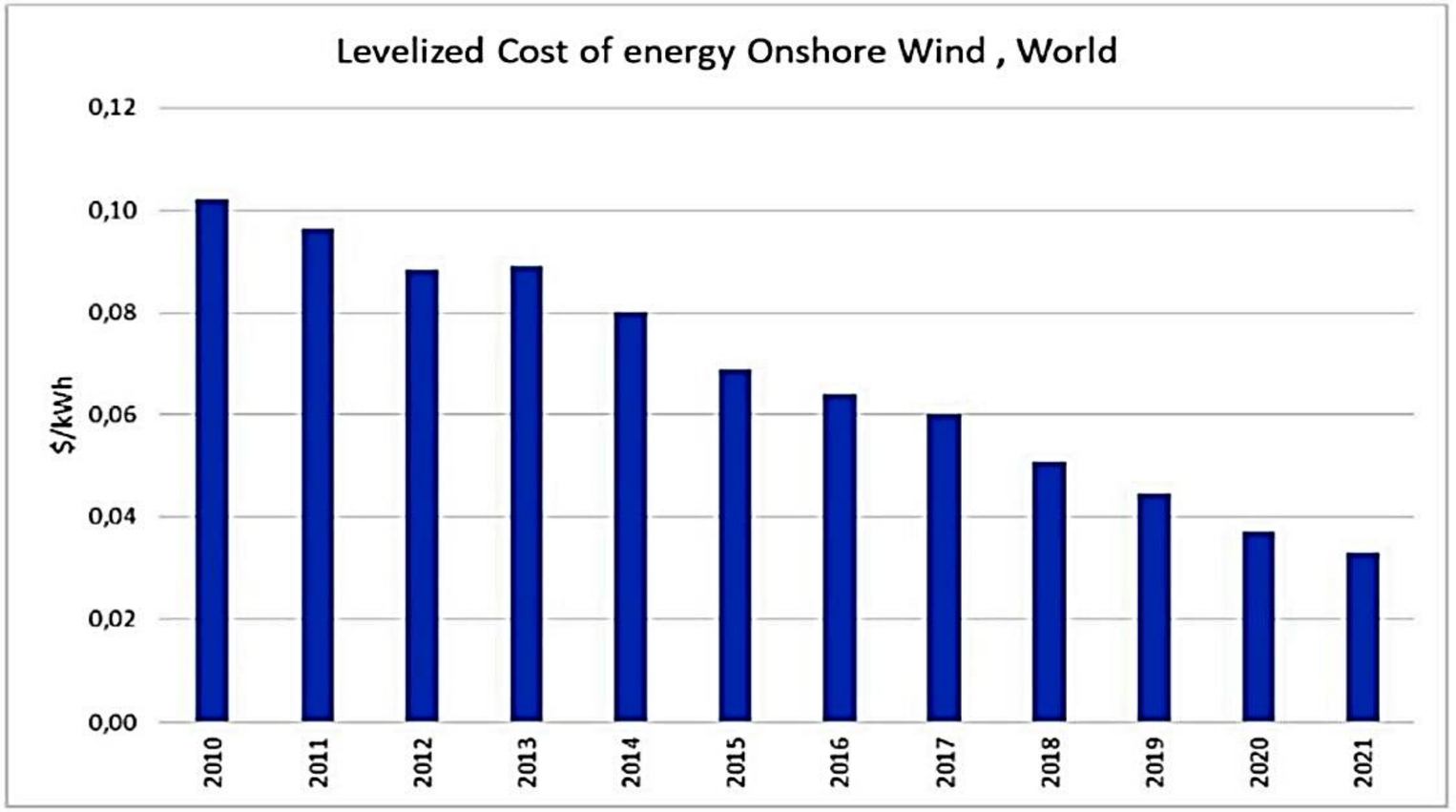
- Nuclear energy – taking into account the complete life cycle – is less economically competitive than onshore wind farms and reactor-size solar energy farms.
- However, it can still be a viable choice in countries that have a nuclear program already underway, and in which the State is available, also for strategic reasons, to partially support the cost of nuclear energy: see above the case of France.
- It should be underlined however that – in the perspective of the unavoidable total decarbonization of energy production - nuclear energy is always preferable to fossil fuels.

TABLE 1 Median values of LCOE.

	Median values of LCOE										
LCOE ($/MWh)	Solar PV	Concetrated solar	Wind onshore	Wind offshore	Gas combine cycle	Gus turbine	Geothermal	Hydro	Coal	Nuclear	Biomass
0–20											
20–40											
40–60	51		52				56	48			
60–80					67				75		
80–100						94				82	81
100–120											
120–140		129		130							
140–160											
160–180											
180–200											

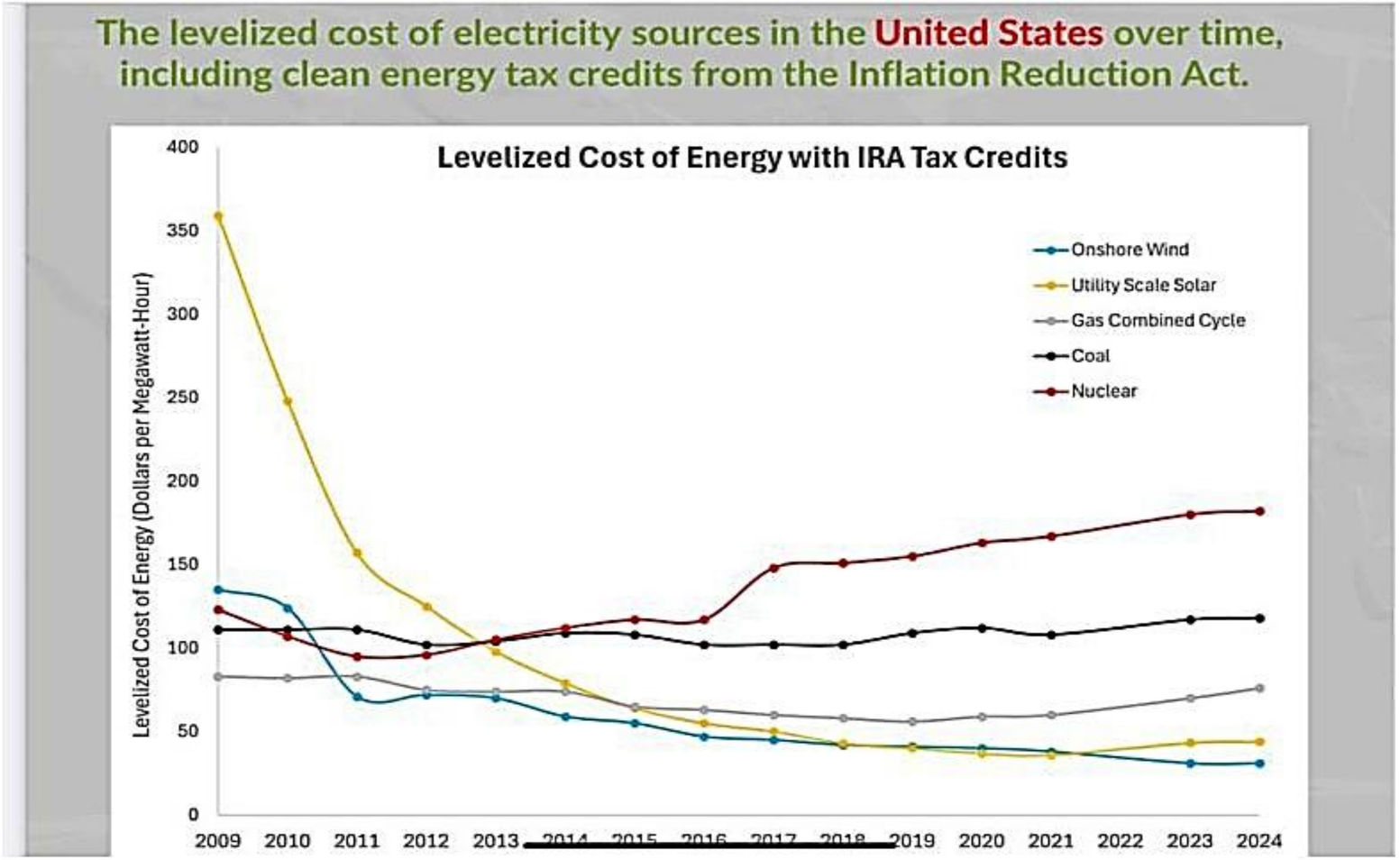
Source: G.R. Timilsina, Demystifying the Costs of Electricity Generation Technologies, World Bank Group, 2020.

- The only non-renewable energy admissible to a comparison with renewables in terms of costs is nuclear, because it is also “low carbon”, beyond the controversies about its safety and the nuclear fuel cycle.
- Fossil fuels, simply, cannot be admissible to a mere economic comparison, for obvious reasons: the Planet is no longer able to tolerate them, and they must actually disappear as soon as possible, "whatever the cost".
- In the short term, natural gas may be a substitute for coal and oil, given its lower CO2 specific emissions



8 World onshore LCOE time evolution. *Source: Our World in Data, "Levelized Cost of Energy by Technology, World," 2022. [Online]. Available: https://ourworldindata.org/grapher/levelized-cost-of-energy. [Accessed 22 02 2023].*

- Renewable energy production costs in Europe, especially for photovoltaics, have decreased dramatically in recent years, with a 75% reduction from 2010 to 2017.
- Even with different approaches due to local situations, the orientation towards renewables is evident in almost all non-European OECD countries too; an example will be made for the USA in the next slide.
- The above figure shows the reduction in the cost of world wind energy generation.



https://yaleclimateconnections.org/2024/09/donald-trump-is-wrong-about-the-cost- of-wind-energy/

- In the United States, electricity generation costs from renewable sources have dropped dramatically since 2010, with future projections indicating further reductions. Currently, neglecting possible policies favoring fossil fuels by the new US administration, wind and solar are the cheapest sources.
- The EIA (US Energy Information Administration, the official US agency at the federal level, has highlighted reductions in a decade of 77% for the cost of a MWh of wind, and 92% for solar.

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Conclusions

- Our analysis of electricity generation costs shows that renewable technologies are becoming increasingly competitive. Projections indicate that costs will continue to decline, making renewables a preferred choice for power generation.
- The adoption of renewable energy has a significant economic impact, helping to reduce emissions and energy costs. Support policies and investments in renewables are crucial for the energy transition.
- Nuclear energy, although less economically convenient than renewables, is the only other energy source on which it is ethically correct to reason in terms of costs, while it is no longer so for any fossil fuel: it can be a valid alternative to fossil fuels in those countries already equipped with a developed nuclear program, willing to economically support this source for reasons that are not exclusively commercial.