

# Energy Transition: Where We Stand

*What's changing, what's not, and why it matters*

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## ABSTRACT

By reading this article, it will be possible to observe that while per capita indicators suggest a diversification of the energy mix and a proportional decline in fossil fuel use, the global absolute numbers tell a different story: all primary sources are still increasing, including coal. This apparent contradiction reveals that, although we are indeed in a transition, it is not a full substitution, but rather an addition on top of an ever-growing total energy base.

## I. INTRODUCTION

For a bit over a decade, the phrase **energy transition** has dominated headlines, policy discussions, and investment strategies. It is often portrayed as a bold, unprecedented shift away from fossil fuels toward clean, renewable sources. For some groups, it is a straightforward shutdown of carbon emission facilities and only building renewables, which is ultimately not feasible. Therefore, it is interesting to step back and look at the long arc of history, when humanity's energy use is more nuanced and far older than we usually acknowledge. Let us make this reflection.

## II. ENERGY TRANSITION ISN'T NEW

If we zoom out, energy transitions have been happening for centuries. Humanity has shifted from wood to coal, from coal to oil, from oil to a mix of oil, gas, nuclear, and renewables. A mix of resource availability, technological innovation, economic advantages, and social pressure has driven each transition.

Crucially, these transitions are not instant revolutions. They are overlapping decades-long processes in which old fuels gradually decline while new ones grow in share and absolute volume. For example, even as renewables rise sharply today, oil and gas remain dominant, and coal is widely used, all of this due to infrastructure change inertia and global demand.

## III. FROM RENEWABLE ENERGY TO FOSSIL FUELS

Until the 16th century, the world's energy economy was overwhelmingly dominated by renewable energy. Human

muscle, animal oil, and labor, wind for mills and sails, charcoal, wood, and water mills were the main engines of production and transportation. For centuries, wood has been the dominant fuel for heat, cooking, and early industry. The energy supply was local, seasonal and limited compared to our current standards.

The Industrial Revolution in the late 18th and early 19th centuries changed that path. Coal emerged as the first truly scalable fossil fuel that unlocks steam engines, mechanized factories, and mass transport. By the mid 19th century, coal had become the backbone of industrial economies.

In Figure 1, there is an estimate the total energy consumption since 1600, and it is possible to see the exponential increase since 1900. During this period, humanity increased significantly the standards of life and, therefore, energy consumption skyrocketed, making a clear link of wealth to energy consumption in our society.

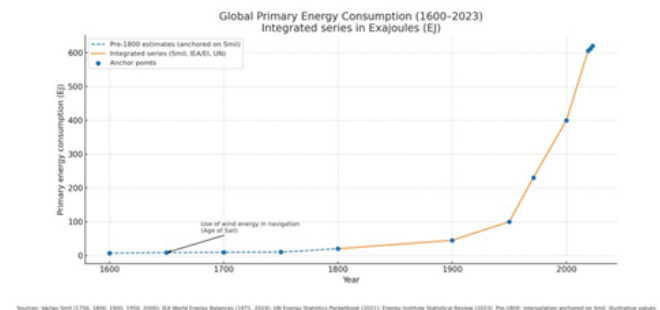


Figure 1. Estimation of Global Energy Consumption since 1600. Source: [1]

## IV. 20TH CENTURY: THE AGE OF OIL AND GAS

Coal was key for the first phase of our industrial revolution. However, the late 19th century brought oil a dense, transportable, and highly versatile energy source that revolutionized mobility, chemistry, and heating. Gas followed, first as a byproduct and later as a major energy source in its own. By the mid-20th century, the global economy had shifted toward a mix dominated by coal, oil, and gas, with hydroelectric and nuclear power emerging as supplementary sources. Petroleum dominated the second half of the century.

Natural gas became important only in the last quarter of the 20th century in an attempt to optimize all petroleum byproducts.

## V. THE SURPRISING “DECLINE” IN COAL CONSUMPTION

When we talk about energy transition today, we often imagine fossil fuels endlessly rising until a sharp turn toward renewables. Yet history tells a different story: coal's absolute consumption has recently peaked and has been declining globally in very recent years. Although it is possible to observe a decline in per capita coal consumption. This trend shows that societies have learned to generate more economic value with less coal per person, a sign of technological progress and diversification of energy sources. The main question is whether this fact is a long-term trend or a simple fluctuation of volumes? In Figure 2 we will be able to see that oil and coal are still holding the main stake of total energy consumption all over the world.

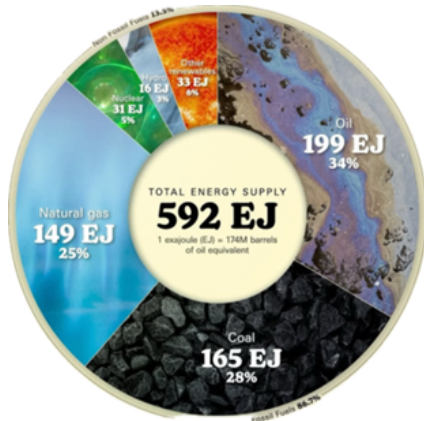


Figure 2. World's Total Energy Supply in 2024. Source: [2]

## VI. THE ROLE OF EFFICIENCY AND DEMAND

One underappreciated factor in this historical shift is efficiency. In the past, energy use per person climbed steadily as industrial economies grew. But in many developed countries, per capita energy consumption has plateaued or even declined in recent decades, even as GDP has continued to rise.

This decoupling means we are producing more value with less energy input per person, an essential, but often overlooked aspect of the energy transition. Considering that the number of people on our planet will not decrease, energy input per person will need to fall.

## VII. ENERGY TRANSITION OR ADDITION?

The answer is yes, there is an energy transition going on as always had, nevertheless not in the way the popular narrative suggests. The energy transition is not a single moment. It is part of a centuries-long pattern of human adaptation. The

return toward renewable and low-carbon technologies is the latest chapter in a long history of energy evolution.

If history is a guide, the coming decades will see continued diversification of the global energy mix and eventually declines in coal use (both absolute and per capita), and significant growth in renewable, natural gas and nuclear capacity. But just as in past, this will not be an overnight switch, it will be a gradual rebalancing, shaped by innovation, investment, and the realities of global demand. In Figure 3, we can observe the increase in investments in renewables, not sure if it will continue that way, but the current this is the actual fact.

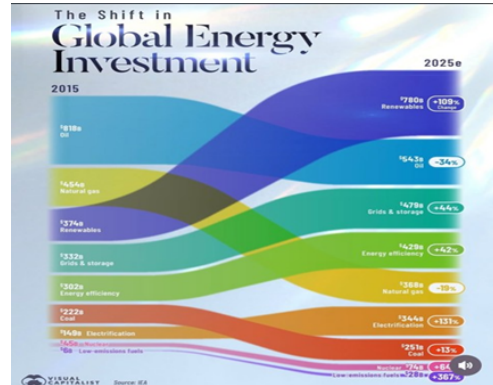


Figure 3. Renewable energy is now the leading sector for investment worldwide. Source: [3]

## VIII. FROM FOSSIL FUELS BACK TO RENEWABLE ENERGY.

The energy transition requires not only increasing the share of renewables, but also effectively reducing the absolute volume of fossil fuels, something that has not yet happened. As long as population and global demand continue to rise, any relative gains will be overshadowed by the increase in total consumption.

If you were expecting a clean break from the past, history offers a humbler truth: **we have been transitioning all along.** The challenge now is to accelerate that process in a way that we get fresh air, without forgetting the lessons of the continued transitions that have come before: human beings are still on earth, and the economy needs to survive.

## REFERENCES

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