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The Energy Challenge: the Transition to a New Energy Model

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Ignacio Mártel de la Plaza (<https://www.bbvaopenmind.com/en/authors/ignacio-martil-la-plaza/>)

PhD in Physics and Professor of Electronics

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6'

Throughout this past year the Covid-19 crisis has concealed many of the planet's major problems. One of the most pressing is undoubtedly global warming, caused, to a large extent, by our current way of producing and consuming energy.

A multitude of politicians and scientists claim the launch of the Green New Deal (<https://www.bbvaopenmind.com/en/science/environment/what-is-the-european-green-deal/>) as one more tool to use to get out of this situation. It emulates the famous New Deal that U.S. President Franklin D. Roosevelt promoted in the 1930s to get his country out of the Great Depression. The implementation of the Recovery Plan for Europe (https://ec.europa.eu/info/strategy/recovery-plan-europe_en) also includes among its objectives the economic decarbonization of the continent. In addition, the U.S. Biden Administration also seems to be setting ambitious goals in energy and environmental issues.

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If these and other similar initiatives materialize, renewable energies will undoubtedly play a key role in not only achieving the promotion of policies that allow mitigating the virus' terrible impact on the economy, but help lead us towards a true energy

that there have already been other energy transitions in the past, motivated by various factors. The content of this article is focused on reviewing that history.

ENERGY AND ENERGY TRANSITIONS THROUGHOUT HISTORY

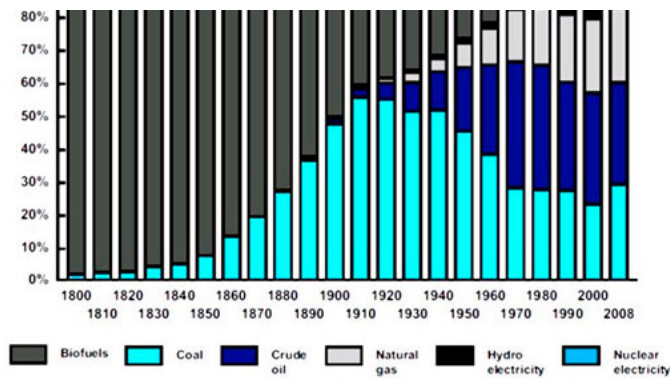
Energy underlies all the major economic changes that have occurred throughout history, especially those of the two last centuries. The three great industrial revolutions that transformed the world over the last 250 years were powered by a variety of energy sources. Each revolution was accompanied by changes and diversification of the energy mix on the one hand and the appearance of new sources of energy on the other, both contributing to distinguish one revolution from the next.



Old factory, abandoned after the nuclear catastrophe of Chernobyl (1986) / Image: **CC0 Public Domain**

The First Industrial Revolution took place between the end of the XVIII century through the XIX century, powered by **coal**, which made the use of the steam engine possible. The Second Industrial Revolution occurred during the first half of the XX century and was driven by the use of oil to power internal combustion engines, while the Third Industrial Revolution, which began in the second half of the XX century and continues until this day, has seen the surge of **electronics** and **information and Communication Technologies**, driven not only by oil, but also by gas and the nascent use of renewable energies. At one time, it appeared that this Third Industrial Revolution would be powered by **nuclear energy**, but the high cost of installation and maintenance of uranium-fueled plants, coupled with the grave accidents of Three Mile Island (<https://hipertextual.com/2015/03/aniversario-three-mile-island>) in 1979, Chernobyl (<https://www.bbvaopenmind.com/en/science/physics/whatever-happened-to-nuclear-fusion/>) in 1986 and Fukushima (<https://energia-nuclear.net/accidentes-nucleares/fukushima.html>) in 2011 have consigned this energy source to a secondary role in many countries that once desired to rely on its use. This is one of the reasons why the energy mix has not changed substantially since the years 1970-1980.

The distribution of the various energy sources used by humans since the start of the XIX century to the present is shown in the illustration:



Biofuels: mainly wood; Coal; Crude oil. Energy consumption in relative terms: 1800=1; 1900=2; 1950=4; 2000=20./ Source: **World Economic Forum** (http://www3.weforum.org/docs/WEF_EN_EnergyVision_Report_2013.pdf) Report.

Since the 80s, **“new” renewable energies (wind and solar, mainly) have been gradually added to the global energy mix** alongside hydraulic power, which emerged at the beginning of the XX century. These new sources of energy should play a key role in the trend toward diversification of the energy mix and help to solve the dilemma between an unsustainable energy model and ever-increasing global demand.

2. THE ENERGY DILEMMA: DEPLETION OF FOSSIL FUELS AND POPULATION GROWTH

At present we are facing a “perfect storm” in the realm of energy, brought on by a lethal combination of **depletion of fossil fuels and the increase in energy demand** due to population increase and improvements in the quality of life of a significant part of the same. (I have analyzed this problem in more detail in a recently published book: Solar Energy. From Utopia to Hope (<https://www.amazon.es/Energ%C3%ADa-solar-esperanza-An%C3%A1lisis-cr%C3%ADtica/dp/8418093188/>))

Maximum consumption of fossil fuels, defined for oil as **Hubbert’s peak** (<http://blogs.publico.es/econonuestra/2016/05/14/para-cuando-el-final-de-los-combustibles-fosiles/>) **has been or it will be reached at some point between 2000 and 2025**. On account of this it has become imperative to find new energy sources to replace fossil fuels in no more than 40-60 years; that is, in our children’s lifetime: