

Nuclear and/or renewables? Let's compare the costs

France and Europe have decided to decarbonize their entire economies by 2050 to fight climate change and move toward energy independence. This is a revolutionary project of immense ambition and difficulty, requiring the production of CO₂-free electricity, which by that date is expected to account for nearly two-thirds of the total decarbonized energy available to meet consumption needs.

However, the production of carbon-free electricity currently relies on two main pathways: the well-controlled use of nuclear and hydroelectric power, or the use of so-called renewable energies, of which wind and solar energies are the only ones with sufficient energy potential beyond hydroelectric power, solar energy being tapped primarily through photovoltaics. But these two energy sources have the major drawback of being variable and intermittent: their production cannot therefore be adjusted to meet human demand.

To overcome this drawback, a large number of complex compensation mechanisms must be introduced, leading to a radical technological change in current electrical systems. This transformation is still marred by technical uncertainties regarding feasibility and would have very serious economic consequences. Not to mention the significant demand for critical materials, of which France does not have sufficient supplies and for which global world reserves are limited.

This means that the decision to base the electricity system primarily on nuclear and hydroelectric power or solely on renewable energy sources (including, of course, hydroelectric power) is of strategic importance for the future, given its far-reaching consequences on the one hand for the security of the electricity supply and, on the other for the cost of electricity production.

Regrettably, this choice is too often made according to ideological or political views, disregarding scientific, technical, and economic realities.

To help resolve this irrational and damaging situation, two members of the Scientific Council of Sauvons le Climat—Georges Sapy for the technical aspects and Henri Prévot for the economic aspects—have combined their expertise to compare, as objectively as possible, two carbon-free electricity mixes: one called “100% renewable,” which requires imported carbon-free hydrogen, and the other called “predominantly nuclear,” where wind and solar power are replaced by nuclear power, and for which no external supply of hydrogen is required.

With the “predominantly nuclear” mix, the cost of electricity is less than half that of the “100% renewable” mix.

It is this unprecedented result, with its considerable economic and social implications, that led to the title of the accompanying supporting study: The impasse of “100% renewable” electricity grids.

This result is open to debate: the study provides the rationale for the technical and economic analyses presented; it lists all the assumptions used; and the simulation tool used is available online.

For further exploration, with the method used in this study it is possible to compare electricity generation mixes based on more or less nuclear power, wind power, and solar power.