A symbolic illustration of the transition to the transport fuels of the future

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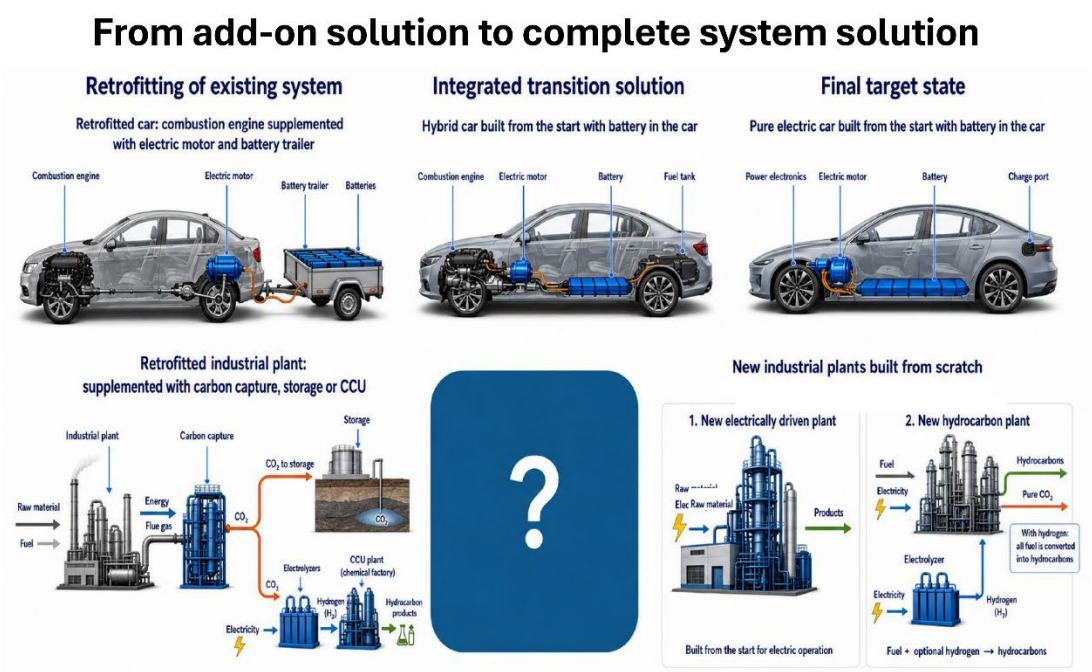

Europe must transform its industry at record speed. Climate targets are necessary, and time is running out fast. It is therefore tempting to choose solutions that can quickly be added to the systems we already have: new technologies retrofitted to existing plants, processes, and regulatory frameworks.

This can be both practical and politically feasible. But there is a risk that is often overlooked: solutions designed to fit old plants can also lock us into old conversion technologies.

In a new study on synthetic aviation fuels, this problem becomes particularly clear. Johanna Beiron and her co-authors show how different routes to produce the same type of fuel molecule can lead to major differences in energy use, cost, and resource efficiency. One route is based on first burning biomass to produce carbon dioxide, which is then

reconverted into fuel using large amounts of electricity and hydrogen. Another route uses the carbon and energy in the raw material more directly in the process.

The issue is not limited to aviation fuels. The same fundamental question applies to many future transport fuels and petrochemical products: should we continue building on today's systems by adding new technical components, or should we design new production systems from the ground up, based on the resource base we will actually have?

The image of the electric car and the battery trailer illustrates this question. A battery trailer may seem flexible, upgradable, and perhaps even practical during a transition phase. But most people intuitively understand that this is not how the transport system of the future should be built.

In the same way, industrial add-on solutions may reduce emissions in the short term, while at the same time making the transition more expensive, more energy-intensive, and less competitive in the long term. The risk is that temporary solutions become permanent — and that the industries of the future are forced to operate according to the system logic of the past.

The image therefore illustrates what is at stake when climate policy, regulatory frameworks and industrial investments are translated into real production systems aimed at building Europe's future competitiveness.