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Myths of Transition

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The importance of an energy transition from fossil fuels to renewables is now accepted as a fact and seen as a guarantee for decades of green growth. But the plausibility of energy transitions stems from a false history, argues historian of science Jean-Baptiste Fressoz: rather than being simply in competition with each other, different energy sources are also in symbiosis. How did the notion of energy transition come about, and what risks does it pose for meaningful climate action?

***Green European Journal*: You argue that the idea of energy transition has no basis in the history of energy. Why?**

Jean-Baptiste Fressoz: The idea of energy transition is overly simplistic because you don't just shift from one energy source to another. If you look at the history of energy, it is obvious that coal did not replace wood, and oil did not replace coal. In the 20th century, for instance, wood energy increased in poor and rich countries alike.

All the historiography is focused on this idea of an energy transition, especially when it deals with the Industrial Revolution, which is generally understood as a transition from wood to coal. But this idea is false. Wood consumption increased along with coal use. True, this increase in wood was not linked exclusively to energy production. Wood was also used for paper, packaging, construction. But its consumption also increased for energy production because to extract coal, you need a lot of wood. In the 19th century, Britain consumed more wood in the form of pit props [used in coal mines] than it burned in the 18th century. This may not be firewood, but it's still used for energy production. So it's impossible to understand the rise of coal without thinking about timber. Without wood, Europe would have had very little coal, and hence very little steel, very little steam, and very few railways. Similarly, the increase in oil use did not reduce the consumption of coal. Still today, coal is indispensable for industrial production, of cement and steel in particular. Seventy-five per cent of steel globally is produced with coal.

We have to forget this idea of big shifts from one energy source to another. It doesn't work like that at all. Energy systems are intertwined. They are completely embedded in one another. Historians – and the general public with them – have been focused on the competition between energies, hence the notion of transition. But energies are both in competition and in symbiosis.

Why does it matter today?

Everyone is talking about a transition to clean energy, but the success of this notion and its appearance of plausibility derive from a false history. We've been accustomed to this idea that in the past, there have been several energy transitions, and if we have done it before through capitalist innovation, we just have to do it again. But what we are doing with new technologies such as solar panels, and to a lesser extent with electric vehicles, is not an energy transition. It's not the radical shift in technology that some people pretend renewables to be.

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If what we are doing is not an energy transition, then what is it?

We are reducing the carbon intensity of the economy. The problem is not so much electricity generation, even though to produce wind turbines and solar panels you obviously need fossil fuels. Given that renewables divide by 20 the carbon intensity of electricity production, they are really worth pursuing.

The issue is rather what we are going to do with all this electricity. Electric cars represent progress compared to combustion engine cars, but they are not carbon neutral. In France, which produces a lot of nuclear electricity, it has been calculated that electric vehicles divide by three the carbon intensity of mobility compared to diesel cars. In most parts of the world, the numbers are even less impressive. All this shows that we are simply delaying global warming. What is conceived as a politics of transition is actually a politics of technological development, which is a fundamentally different thing.

It's important to understand things in these terms because when we talk of energy transition, we dream of an economy that is completely disconnected from carbon in three decades. And once we dream of that, we can think of an economy that continues to expand for centuries without altering the climate, and we don't need to talk about limiting production, rationing, or redistributing. Thanks to the transition rhetoric, climate change demands a technological, not a social or even civilisational change. It's a convenient way of thinking of the climate crisis, but also a dangerous one because this shift is not going to happen. One of the key responses to the climate crisis should be a politics of redistribution.

Yet Europe is set to become the first climate-neutral continent by 2050. Isn't it on a path of transition?

This is just a self-satisfying narrative. Europe is heavily dependent on fossil fuels for all sorts of reasons. If you look at the national emissions of France or Britain, the two countries I've studied most closely, the picture seems quite gratifying: both countries are reducing emissions. But if you bring into the picture the CO_2 emissions linked with international commerce, things are not moving fast enough. It's easy to decarbonise when you deindustrialise.

Besides international trade, rich countries are dependent for their prosperity on global growth. This is obvious in the finance and the service sector. London and Paris depend on the growth of the global economy, which is based on fossil fuels for the most part. Switzerland, for example, is an extremely prosperous country with low carbon emissions. But it has in its accounts some of the largest mining companies in the world, such as Glencore and Trafigura. Switzerland's prosperity is deeply enmeshed with coal and fossil fuels in general. So I think Europe needs to be careful about giving lessons to developing countries because this would be unfair.

In the beginning, the energy transition was merely an industrial slogan.

What about China's energy strategy? Beijing is the global leader in green tech, but is also still heavily reliant on coal. Do you see a contradiction there?

China's energy landscape is only contradictory if you have a wrong vision of the dynamics of energy, which thinks of energy sources as if they were simply in competition with each other. But this is not always the case. In a way, China is the only country where things are happening fast. Around 80 per cent of the world's solar panels come from there. But China is still a developing country, with a much lower per capita electricity consumption than the US despite being far more industrialised. So it makes sense that Beijing is investing in all sources of energy.

For instance, China is developing huge solar and wind complexes in the Gobi Desert, as well as in its northern region of Inner Mongolia. These energy hubs are far away from where most of the electricity is consumed, so you need the infrastructure to transport electricity east and south, and this costs enormous amounts of money. To make this investment profitable, you need a coal-fired power plant near the solar and wind parks, because sometimes renewables need backup. An electrical system that functions exclusively on renewables remains, for the time being, a fantasy. This shows that the development of energy happens on different fronts at the same time, not just in the direction of renewables. Solar panels, in this case, are not in competition but in symbiosis with fossil fuels.

If the notion of energy transition is fundamentally flawed, how did it impose itself?

In the beginning, the energy transition was merely an industrial slogan. The concept comes from a very self-interested discourse from the late 19th century. But until the 1970s, it remained very much on the fringes. Experts from different fields – geology, statistics, engineering, forestry, economics – did not speak of an energy transition because they were aware that energy doesn't work like that, with big shifts from one source to another. But there was one group of intellectuals who saw things differently: atomic scientists.

Atomic energy promoters thought of the future of energy over the very long term. They envisioned a scenario in which fossil fuels would become scarce and therefore uncompetitive, making the transition to atomic energy inevitable. So this idea of energy transition was initially a futurology, not an empirical analysis of what was happening. This imagined future of fossil scarcity was used as a justification to put public money into atomic research in the US.

The 1970s was a key decade for mainstreaming the energy transition narrative. With the energy crisis, talk of an "end of the oil age" became dominant in the political discourse and the public sphere, and the energy transition was presented as a solution. This popularisation of the notion of energy transition also came with a fundamental shift in its meaning: it became an empty container that everyone could fill with their own vision – it could be about coal, more oil, a new pipeline in Alaska, or research into new breeder reactors. That's the great strength of the energy transition: everybody is in favour of some version of it.

The environmental movement also embraced the energy transition narrative.

Yes, and this is a crucial point. US environmentalists of the 1970s bought into this very wrong discourse about energy because they wanted to be relevant. The energy transition narratives offered key figures of the environmental movement, such as Amory Lovins, the British representative for the environmental organisation Friends of the Earth, the opportunity to go from being purely oppositional, anti-nuclear activists, to having a positive agenda: a transition towards solar and wind energy. That agenda is what allowed Lovins and others to go to Washington, talk to US President Jimmy Carter, and become respected consultants.

The Intergovernmental Panel on Climate Change (IPCC) has played a major role in informing government action and public discourse on climate. Did it also contribute to popularising the

idea of energy transition?

The IPCC's Working Group III is focused on solutions. In the beginning, it was led by American experts who were overly climate-sceptical. They wanted to calm down the climatologists and give voice to agriculture, energy, and industry (including fossil fuel) experts. Group III was then dominated by the expertise produced in the US by people like William Nordhaus, the first economist working on climate change, who won the Nobel Prize in 2018. Nordhaus' vision for the energy transition was that yes, there is climate change, but we shouldn't do anything, except invest in research and development (mainly in nuclear energy). In his view, it was better to delay the transition until the technologies were ready. So the transition narrative was essentially a way to justify procrastination.

This was the perfect discourse for the US administration at the Rio Conference in 1992. Everybody was looking to the US, the largest global emitter and the richest country. Offering the prospect of a technological solution to climate change meant that Washington didn't have to take action.

Much has changed since the 1990s, but not to a drastic extent. Following the 2015 Paris Agreement, "transition" became the pivotal term in the Group III report. Indeed, to stay within the 2-degree Celsius threshold, a radical reduction in the use of fossil fuels is imperative.

The idea that innovation and technological progress will save us from climate change has not gone away. What would be a healthy attitude towards climate tech?

We should be neither technophobes nor technophiles, but have an adult vision of technology and look at what is realistically possible.

Nordhaus had this notion of "backstop technology", which started with the oil crisis. The idea was that we would never run out of energy because there would always be technology ready to replace exhaustible sources – in his mind, nuclear power and the breeder reactor would replace fossil fuels. He had the same view on climate change: backstop technologies will solve it.

Today, Group III is still relying on a sort of backstop technology: "negative emissions", whether through direct air capture (DAC) or bioenergy coupled with carbon capture (BECCS). These and other dubious technologies took huge prominence in the last two IPCC reports. This shows that there is an issue with mainstream economic expertise on climate change, reflected in the work of Group III, which we should be able to address without discrediting the IPCC process as a whole.

What is the relationship between the success of the energy transition narrative and climate adaptation?

The energy transition discourse is not in opposition to climate adaptation. Both are discourses of procrastination. Again, we need to look at the 1970s. In that decade, the very same climatologists who raised the alarm about global warming defused it at the same time by saying, We will be fine because we'll do an energy transition before the climate crisis. It takes around 50 years, they said, to do an energy transition. Of course, they had no clue how long it would take because they had never done one, but the idea was there.

However, it soon became clear that this wouldn't be the case. Serious modelling efforts that were made at the time showed that there would be fossil fuels in the distant future and in larger quantities, especially because of the ongoing economic development in Asia. The late 1970s were also the time when everyone understood that nuclear plants would not be as successful as expected a decade earlier. The

Three Mile Island nuclear accident in Pennsylvania, US, contributed to that realisation. There was a huge push towards coal, also fuelled by China's plans to rely massively on coal between then and 2000.

So by the early 1980s, it was already quite clear that climate change would happen. Between 1976 and 1982, there were three conferences on climate adaptation in the US. The attitude was quite optimistic for the country. Plus 3 degrees Celsius by 2100? Sure, the US can adapt. Agriculture will be the most affected sector, so agricultural production will be relocated. There will be GMOs, the techno-fix of the time.

There was optimism, but also a great deal of cynicism: US experts knew that for other countries it might be more difficult to adapt. They were aware that there would likely be mass migration, which they saw as a form of climate adaptation. So transition was about postponing action, and adaptation is what happens when you keep postponing it.

If what we are currently doing is simply reducing the carbon intensity of the economy, what should we be doing instead?

I am fascinated by how many of my colleagues look at the sudden growth of renewables as a sign that we are on a transition path. Even if renewables grow exponentially, it doesn't mean that fossil fuels are following a symmetrical curve of decline. The diffusion curve of renewables is not a replacement curve. So we should keep lowering the carbon intensity of the economy, but we also have to talk about degrowth, rationing, and reducing material consumption.

Forty per cent of global electricity is already decarbonised, and we should continue in that direction. But for material production (cement, plastics, steel), solar panels are not really a solution. It's not impossible that they will become one in the future, but they won't have such a big impact in these industrial sectors by 2050. So we have to reduce material consumption.

To do that, we should be discussing the social utility of CO2 emissions. We're not going to cut all carbon emissions, but we can ask the question, Is this CO2 useful? Or is it a luxury emission? Cement, for instance, is going to be very difficult to decarbonise, but it can be very useful, for example to build pipes in the developing world and give people access to clean water. However, if cement is used to build yet another motorway in Europe or the US, then the social utility of those emissions is much more questionable.

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