

Radical innovation and energy system inertia; can the mission economy solve the climate puzzle?

Johan Albrecht (Ghent University)

After more than 30 years of international climate policy, global energy-related CO₂ emissions continue to increase. The gap between actual emissions and emission trajectories to meet climate stabilization targets such as the 1.5°C Paris ambition is widening. Since 1992 UNFCCC, emissions in Europe have been reduced by more than 30% but this reduction is mainly due to the collapse of Eastern European energy-intense economies and the closing down of obsolete coal-powered industrial assets in Western European countries at the end of their capital cycle. The Green Deal was launched in 2019, but between 2014 and 2018, total energy-related CO₂ emissions in the European Union were reduced by a staggering 1.1%... Although European emissions were close to stable in the years preceding the Green Deal, no new policy schemes or instruments were introduced after 2019 to meet the very challenging decarbonization target. A sharpening of existing policies appears to be sufficient.

Climate policies aim to replace the fossil energy system by a low-carbon or renewable energy system. But the resilience of the fossil system is remarkable. At the global level, the share of fossil fuels in total primary energy demand is nowadays close to 80%, just like in 2000 or in 1990. In 1971, the share of fossil fuels in total demand was 86.6%. Since 1971, the global energy system almost tripled and the expansion of renewable energy sources could not follow the increase of total demand. In the last decades Europe has a more or less stable total energy demand because of the limited economic growth rate and various energy efficiency policies. The share of fossil fuels in the European energy system has been reduced from 82% in 1990 to approximately 68% nowadays. It took more than three decades to lower the share of fossil fuels by 14% but we have less than three decades left to further lower the share of fossil fuels to 0%.

The fossil system has not been designed by policymakers or negotiated at an international energy conference. In essence, free market forces selected fossil fuels because of their advantages over alternatives such as biomass. This 'selection process' took more than 150 years. How can we reshape the complete energy landscape in a few decades? The energy system has no pause button. We cannot turn the energy system off because there is a high need for continuous service provision. As a consequence, we add new assets like renewable generation capacity to the existing system in the hope that new assets will replace old fossil assets. Hence, we are still in the easy phase of the energy transition.

From a policy perspective, there is little attention for the remarkable fossil resilience or the pressing challenge of a smooth system integration once more renewable assets, new technologies (heat pumps, EVs,...), new algorithms and new electricity tariff formula hit the market. Surprisingly, policymakers have a strong believe in the capacity of free markets to solve these and other challenges. For neoclassical economists, the role of policymakers is limited to the introduction of optimal economic incentives like a carbon tax or a price on the permit to emit one ton of CO₂. A powerful price signal should then harness

the invisible hand of the market place to steer economic actors towards a low-carbon future. No economist will object to the internalization of externalities like potential climate damages into final market prices. In the European context, EU ETS has a significant impact on investment decisions of large energy-intensive companies but the impact of carbon prices on the final consumer remains limited. Nobel Laureate Herbert Simon stressed a long time ago that we do not live in a market economy but in an organization economy in which not market forces but powerful organization set prices in bilateral long-term contracts. As a consequence, even drastic fluctuations of the EU ETS price during months do not have an impact on the final retail price of e.g. energy-intensive food products. But as long as consumers are shielded from carbon price fluctuations, they cannot respond and the invisible hand is not activated.

The dominant neoclassical market-based perspective on public policy is challenged by authors such as Mariana Mazzucato. In her 'Mission Economy' book she states that our lethargic transition pace is a lesson in what can happen if government leaves the market to sort out problems and abstains from assuming its entrepreneurial role in society. For Mazzucato, mainstream economic perspectives of simply solving climate change with a carbon tax and some R&D subsidies have left us with negligent carbon tax systems and a worryingly slow green transition. As an alternative, governments should create and shape important new markets with direct market interventions. In her work, Mazzucato refers to the iconic Moonshot project or Apollo program as launched by President John F. Kennedy in 1962. This program not only did bring people to the moon and back but triggered a tsunami of novel civilian technologies and new markets (e.g. software engineering, micro-electronics, portable computers, navigation technologies, LED, photovoltaics, water purification,...). The Apollo program reshaped modern life in four decades and did give American companies an enormous technological advantages in key technologies. Interestingly, the total cost of the Apollo program in actual terms is estimated to be 'only' \$ 280 billion (\$ 2024). In 2022 and 2023, Europe did spend more than € 850 billion - or the equivalent of three Apollo programmes - on fossil energy subsidies without any beneficial impact on Europe's capacity to innovate.

The enormous impact of the Apollo program on modern life is on itself not an argument for direct market interventions by governments that want to create new market segments with societal benefits. Apollo created and shaped a unique a very competitive research markets because free markets do not invest in radical and very uncertain technological trajectories. Public R&D-efforts are needed to correct for obvious market failures. Furthermore, the impact of Apollo on society is a tribute to the allocative superiority of free markets. Just imagine that somehow the Soviet Union owned all 'the Apollo innovations' in 1973. In an environment without entrepreneurship and economic freedoms, it takes much more time before new technologies do reach final consumers.

The inventions of the Apollo program transformed modern society in four decades and this process has not been regulated or steered by dedicated incentive schemes. It just happened. To achieve climate stability, an Apollo-inspired and competitive research effort based on 'pay-for-performance' contracts could deliver more innovations than the current R&D-approach. Once radically new technologies become available, supporting policies can accelerate their diffusion in free markets within the next decades. The

invisible hand should not remain empty and receive instructions about the direction with most public benefits.